THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIII. No. 1876.] LONDON, APRIL 25, 1899. [51ST YEAR. PRICE 6d.

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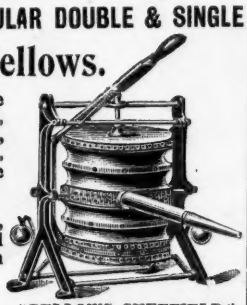

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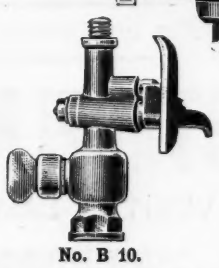

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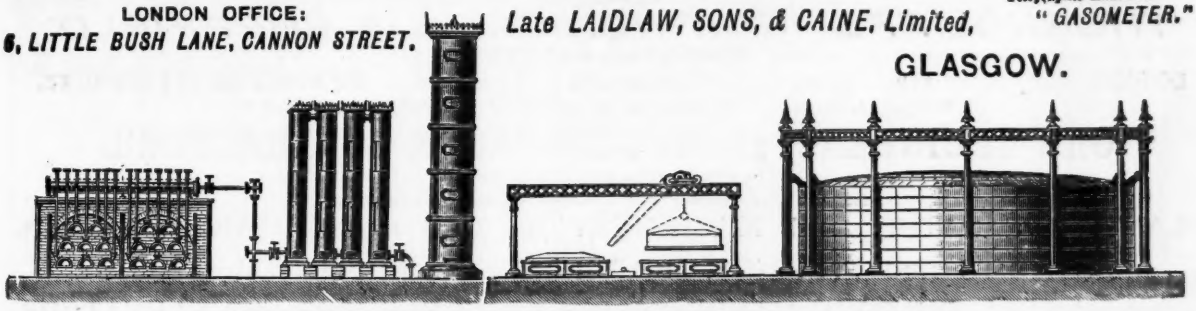

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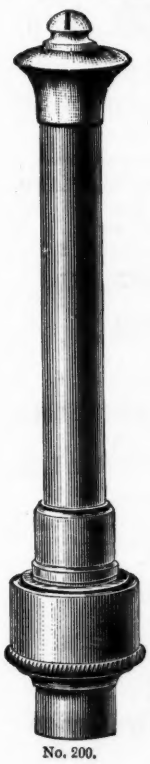

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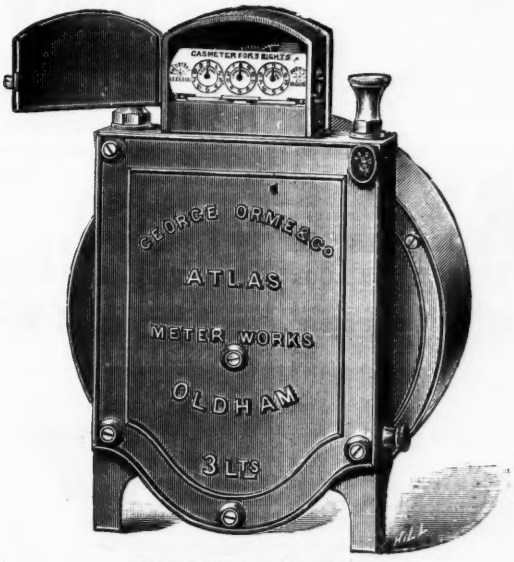

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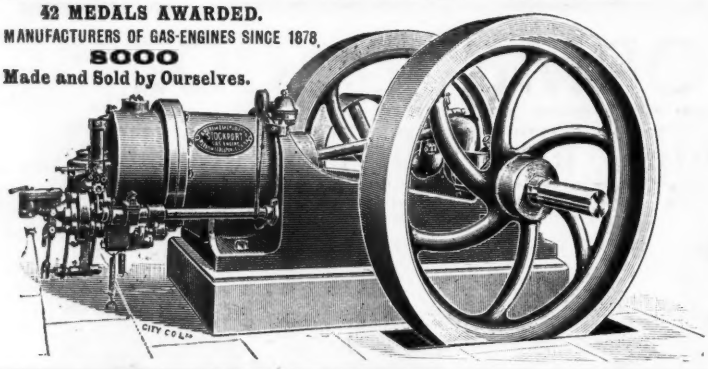

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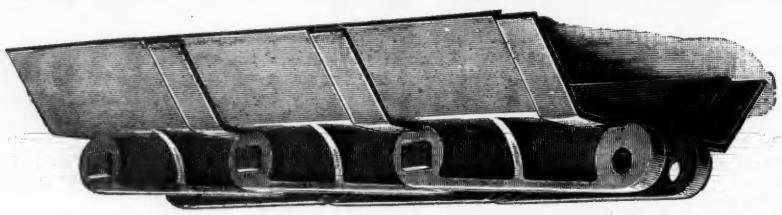

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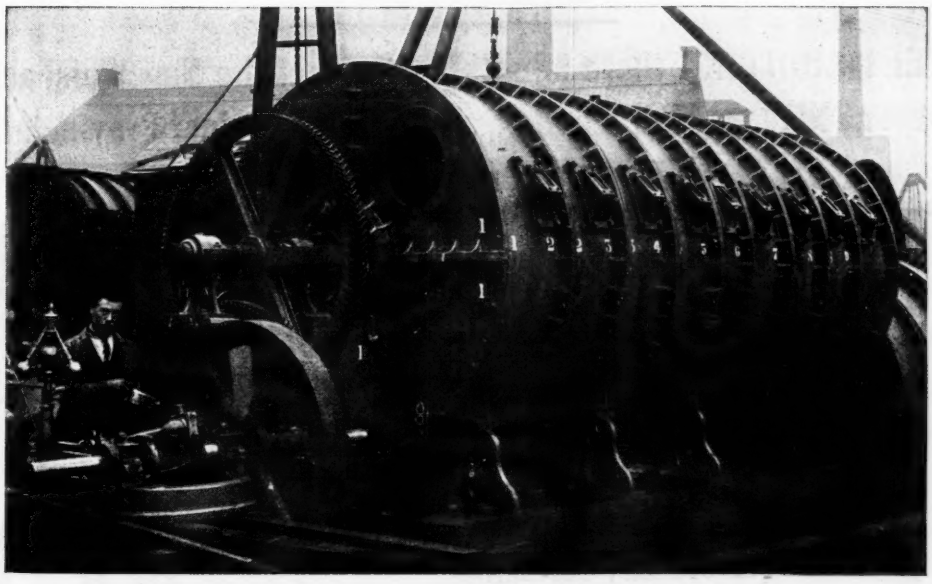

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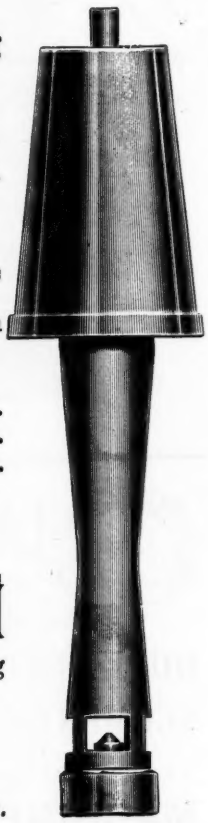

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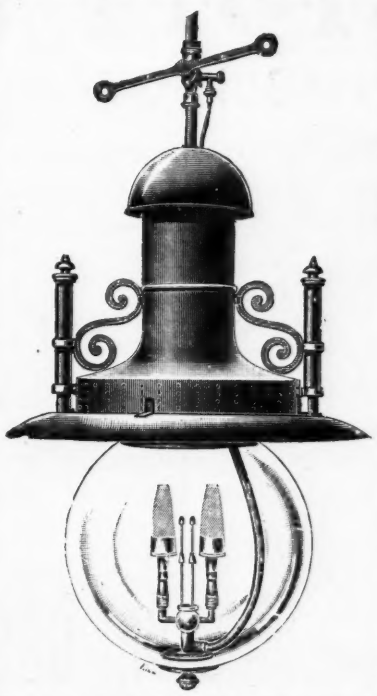

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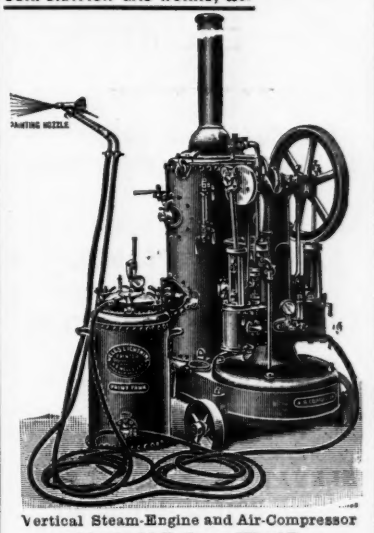

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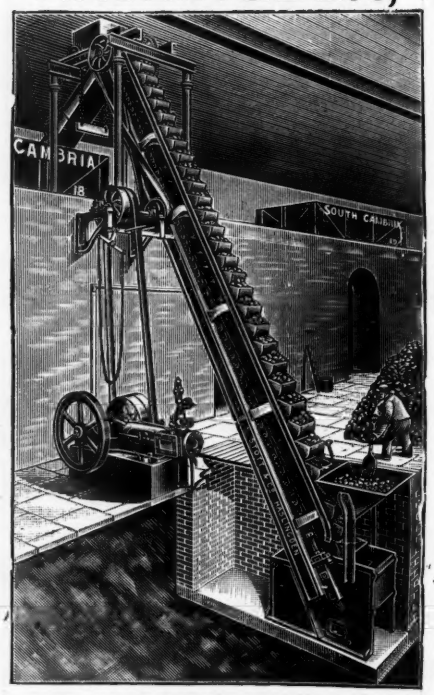

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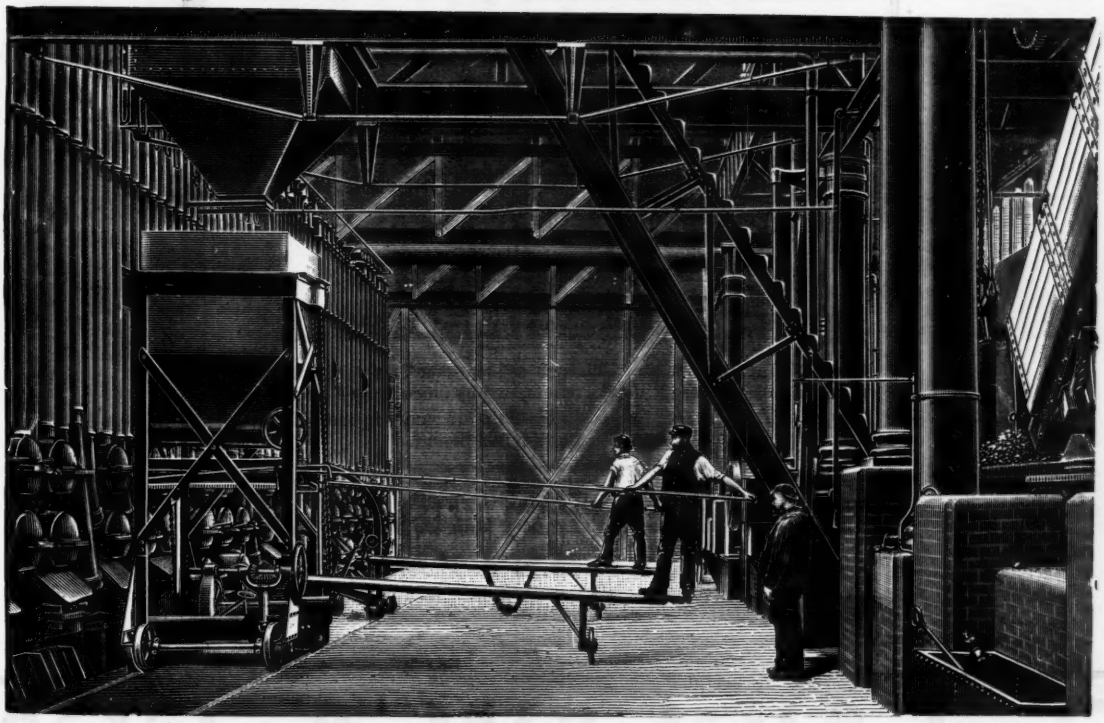

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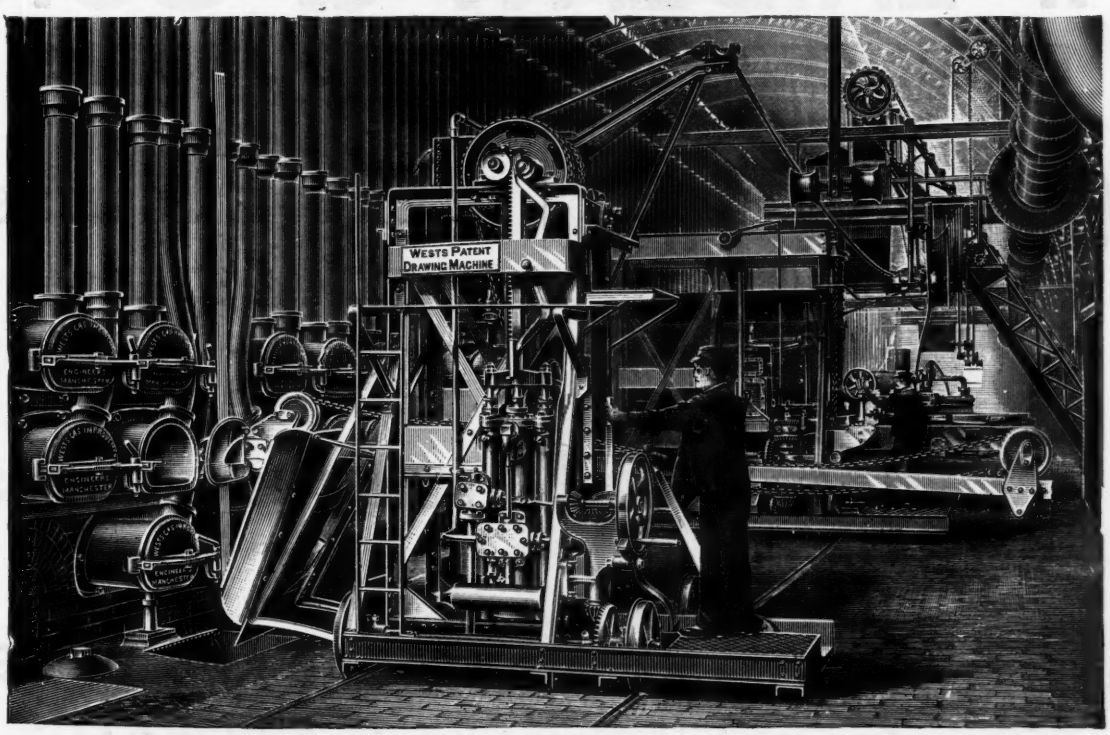

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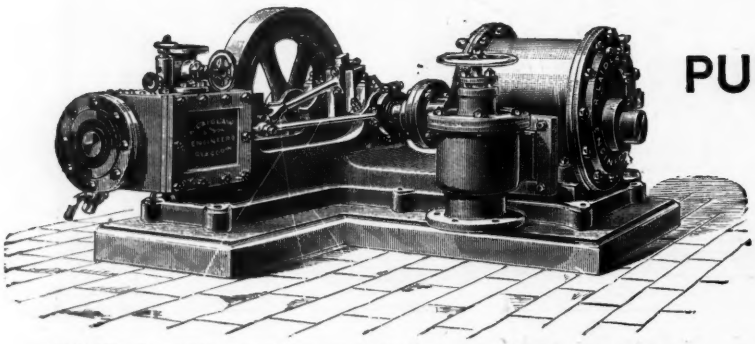

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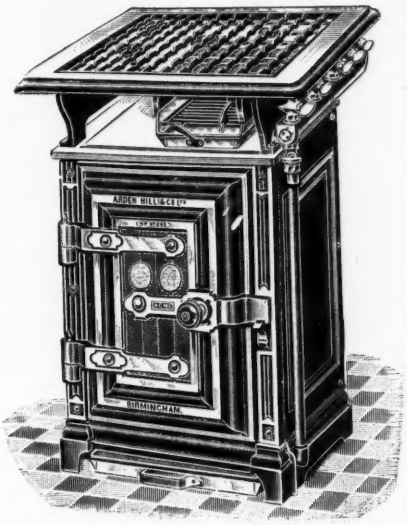

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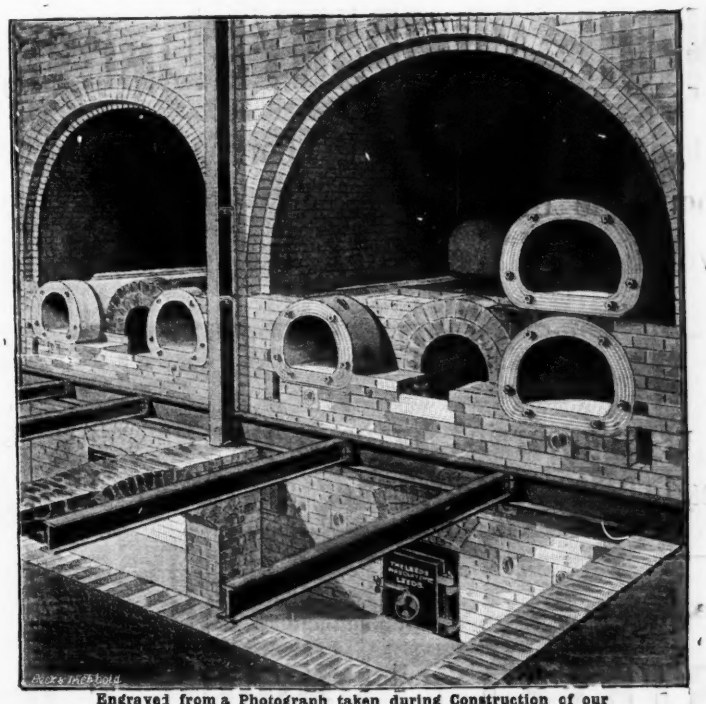

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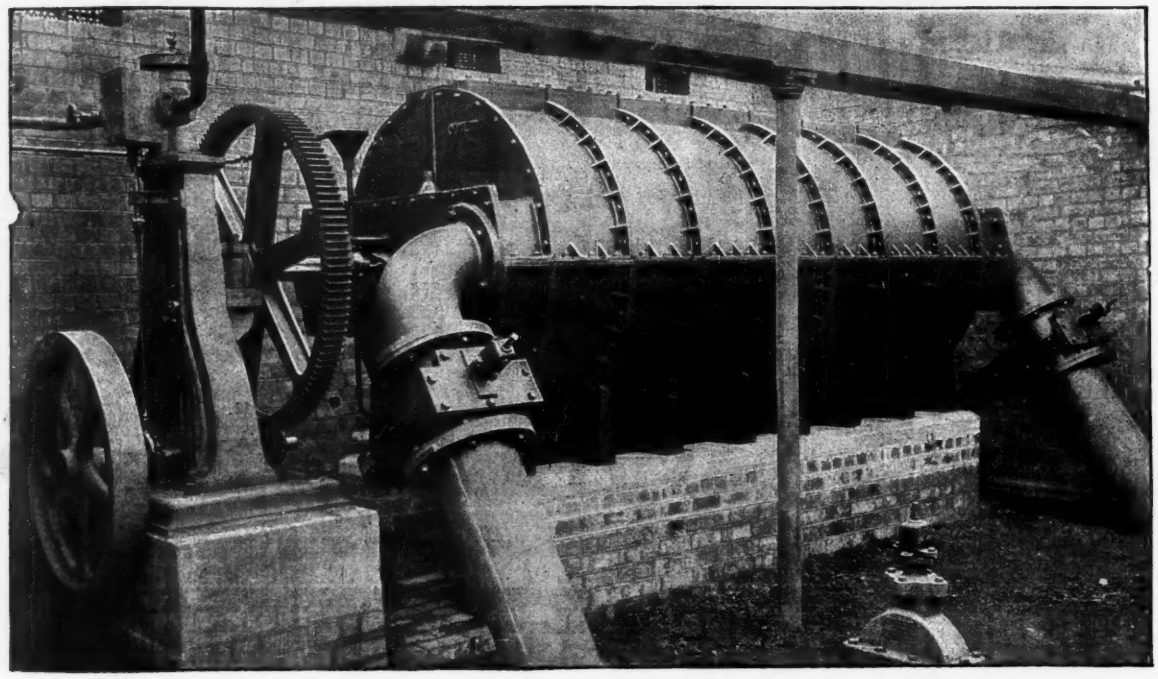

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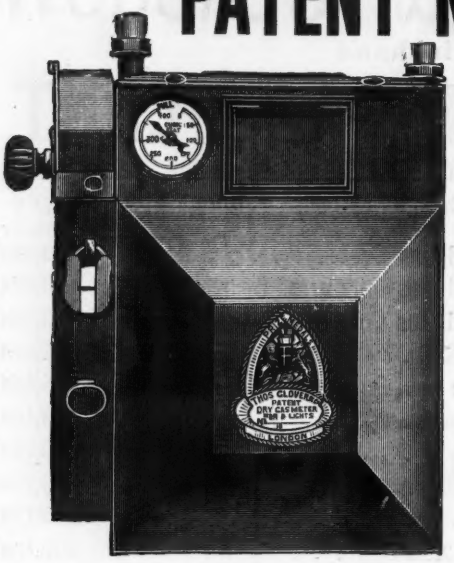

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EDITORIAL NOTES.

The Meeting of the Institution of Gas Engineers.

THE annual meeting of the Institution of Gas Engineers on Tuesday, Wednesday, and Thursday next, under the presidency of Mr. F. D. Marshall, of Copenhagen, promises to preserve the pleasing international flavour which previous gatherings of the organization have acquired. The first two days' meetings are to be held at the Institution of Civil Engineers, Great George Street; and the third day will be devoted to a visit to the reservoir works at Staines, followed by a launch trip down the river to Richmond. Few earthworks of such magnitude as those now in course of execution at this site by Messrs. John Aird and Sons have ever been undertaken in this country; and already upwards of £100,000 worth of work has been done here. Six papers are listed for reading and discussion; and the Secretary (Mr. Thomas Cole) draws attention to the decision of the Council to have prints of the papers prepared in advance, which will be obtainable on application by members specially interested in the subjects. He will also be glad to receive the names of members intending to take part in the discussion of any paper, which it is desired to make as complete and exhaustive as possible.

A variety of questions of great and living interest for gas engineers appears under the titles of the papers. Mr. J. O. V. Irminger, of Copenhagen, who has given years of study and high experimental ability to the elucidation of the subject, will describe some of his experiments with regard to "Wind Pressures on Buildings." A practical matter of great and growing importance—"Coke Handling" "Plant"—will be presented to the meeting by Mr. Thomas Holgate, of Halifax. Mr. G. P. Lewis will treat of "Retort Heating"—a subject which, as we have had previous occasion to remark, has rather fallen into the background of late years, though it lies at the root of efficient carbonization. As a matter of fact, we do not recall a paper in which the setting and heating of benches of retorts has been properly dealt with in a broad, scientific way, without any ulterior purpose of recommending some speciality. Mr. C. C. Carpenter will read a paper on "Distribution," in which we may be sure the modern need of high-pressure gas distribution will be effectively met. Professor V. B. Lewes on "Incandescent Mantles" should not require advertisement. Mr. C. F. Botley ought to be in a position to disseminate some useful information on the "Practical Working of Carburetted Water "Gas." The annual dinner of the Institution will be held at the Trocadero Restaurant on Tuesday evening; and it is greatly to be desired that the members will make an effort to show their appreciation of this feature of the meeting. We understand that the Chief Magistrates and officials of the City of Copenhagen and the Municipal Gas-Works are to be guests of the Institution. Several of the Managers and officials of the Danish Gas Company have also been invited; and some of the leading Engineers of the Imperial Continental Gas Association, who will be in London next week, are also expected to attend the meeting. Last, not least, the professional world will expect something good in the Presidential Address.

By the way, just as we are going to press this week, the Volume of "Transactions" of the Institution for 1898 has come to hand. As usual, it contains a valuable collection of working drawings, forming an Appendix to the report of the proceedings of the meeting. This includes a description, with working results, of the inclined retorts at Brentford and Southall, supplied by Mr. J. Husband, particulars of a gasholder and tank for the Newcastle-upon-Tyne and Gateshead Gas Company, by Mr. W. D. Gibb, and a few abstracts of chemical papers.

"For the Prevention of Trade Bribery."

THE Bill brought into the House of Lords last Thursday for dealing with the evil of illicit commissions in trade, and received favourably on the representations of its distinguished author, Lord Russell of Killowen, is a formidable-looking measure of 23 clauses and any number of sub-clauses. It is entitled "A Bill to Check Corruption, 1899;" and altogether apart from its subject matter, it is certain to be closely scrutinized as a Judge's effort in Bill drafting. The eminent occupants of the Judicial Bench of this country are so apt to find fault with the wording of the statutes they are required to execute, that a real live Chief Justice's production in this line ought to be something

of a model. The text of the Bill was published *in extenso* in the "Standard" last Friday; and we do not propose to reproduce it, because the followers of the gas industry are no more particularly concerned with its provisions than persons in any other trade. Indeed, the application of the proposed amendment of the law is not to occupation, but to *status*. As enunciated by Lord Russell himself, the object of the Bill is to check, by making criminal, those inequitable and secret payments to persons who are agents of the principals to bargains, which tend to shake confidence between man and man, and discourage honest trade and enterprise. By way of effecting this end, clauses 3 to 8 of the Bill declare certain specific transactions to be corrupt unless the contrary is shown. Thus, the third clause runs: "Every valuable consideration given or "offered to any agent, by any person having business "relations with the principal of such agent, shall be deemed "to have been corruptly given or offered unless it be "proved (*a*) that the principal had given his consent "thereto, or (*b*) that the valuable consideration was not "calculated or intended, and had no tendency to corrupt "the agent, by inducing him to do or to leave undone "something contrary to his duty, or by creating any other "undue influence on the mind of the agent."

The moral basis for the proposed legislation is the obvious truth that the receipt of these commissions creates a conflict between interest and duty. The vice of the thing is its secrecy. The proposed Act does not apply to any open and above-board payments. Essentially, the Act will extend to all business dealings the provisions of Lord Randolph Churchill's Act of 1889. It is a question as to how far this law has proved effectual; and Lord Russell's opinion is that, though there have been few prosecutions under the Act, it has nevertheless wrought a material and very important change for the good. Consequently, Lord Russell holds that if his extension of the law takes effect, it will work insensibly in the same way, and that many people will gladly fall back upon the Act "as an answer and means of defence to which they could "resort in resisting the attempts of blackmailers to insist "upon payments as commissions or bribes for orders." Various practical questions naturally arise in regard to the proposed legislation and its machinery. A very necessary safeguard against blackmailing or vexatious proceedings lies in the reservation to the Attorney-General, or the Judge, of power to order a stay of proceedings. Also, the Bill itself defines the term "valuable consideration" as excluding mere "tips" to persons in a menial capacity, and reasonable hospitality. The thing to avoid is, of course, any appearance of undue stringency, or the creation of offences not regarded as such by public opinion. Public sentiment is the justification of legislation; and this, reacting, smartens up public opinion where it happens to be lax or incurious. In view of the great difficulty of obtaining evidence in this class of cases, the Court is to have the power of indemnifying witnesses whose testimony might be self-incriminating. The penalties on conviction under the Bill are sufficiently heavy—comprising imprisonment for two years, with or without hard labour; a fine of not exceeding £500; or both imprisonment and a fine—besides forfeiture of the amount of the "valuable con-"sideration" received, and the sacrifice of any right to a pension or compensation.

After all, as Lord Russell admits, the best hopes for the Bill must repose upon the known and painful fact that many people who are perforce parties to the practices at which it is aimed would be only too glad to be delivered from them. They bribe because they have the conviction, well or ill founded, that it is impossible to get orders in any other way. There are many degrees of this corruption of trade; and some of the smaller ones, which might be covered by the term "lubrication," will probably persist to the end of time. Though the world be never so virtuous, there will always be "cakes and ale" for the less austere. The mischief begins with the greediness of those in a position to receive gifts, who will not rest satisfied until the present becomes a "valuable consideration." There will always be difficulty in ascertaining the existence on the part of the agent of the corrupt expectation. Few bribes are demanded in set terms, though this is occasionally done. Trade rivals who lose orders to one another will always suspect the means employed; and the man who knows himself to be suspected is under the sharpest temptation to justify the imputation. He thinks he may as well have the plunder as the repute of it. Moreover, all the penal legislation in the world will not relieve principals of their duty to encourage honesty and devotion on the part of their agents by sufficiently rewarding the services of the latter; and to keep a sharp look out, after all, upon the manner in which these services are performed. It is still opportunity that makes the thief, in many cases.

Another Welsbach Legal Victory.

THERE cannot be many more such Welsbach patent actions as that of this Company against the Daylight Incandescent Mantle Company, Limited, which has just ended in the usual way, as we reported last week. It was a piece of litigation of rather more general interest than most of the incandescent mantle infringement cases which have given the Welsbach proprietary so much trouble; but the issue was still one of infringement only. In the Welsbach master patent specification, of the year 1885, which was the basis of the heavy Sunlight and De Mare litigation, the inventor described the means whereby the incandescing substances were to be exposed to the heat of the gas and air flame (the mantle), and also the nature and method of applying these substances (the rare earths). Mr. Justice Wills declared this patent to be valid for the mantle and the incandescing material—the whole thing, in short. It is unnecessary to go into the particulars of the cases above mentioned. Enough to say that the Welsbach mantle was held to be a very comprehensive kind of fabric; while Welsbach was given exclusive use of the "rare earths" for incandescent lighting. The only arrangement of the kind that has been allowed to escape through the meshes of the law which has so completely covered the Welsbach invention is the Sunlight mantle, in which the active illuminating substance is chromium—a mineral that was not mentioned by Dr. Welsbach, and not included in the category of the rare earths. Ever since this decision was given, manufacturers of incandescent gas-burners have been trying how near they were able to get to the Welsbach preserve without breaking the law. Many of them have indulged in poaching, pure and simple; but of this it is unnecessary to speak, as it is an "affair of police." The Daylight mantle, however, was put forward as an improvement of the Welsbach speciality, upon grounds which were at least debateable. It was made of combustible fabric, like the Welsbach and the Sunlight mantles, which was no infringement inasmuch as what the Sunlight people can do in the way of mantle manufacture is open to anybody else to copy. The new mantle was dipped in a solution of zirconia and other substances. Substantially, at this stage, it was a zirconia mantle. After being burnt off, what remained of the mantle—the zirconia skeleton—was dipped, as a separate process, in an alcoholic cerium solution, which imparted the illuminating power. The question was whether this specific use of a small proportion of cerium, in such a manner and for this particular purpose, was an infringement of Welsbach. It will be noticed by the curious in these matters that the element thorium, which figured so importantly in the previous litigation, has now apparently dropped out of this consideration. This is because it has been found that a small proportion of cerium added to a zirconia mantle gives a good light. Since 1893, the Welsbach mantles have consisted chiefly of thoria, with a small addition of cerium. The Daylight mantle dispensed with the thoria, for which Welsbach has an unquestioned monopoly, and depended on the alleged new fact about cerium—that a little of it gives a good illuminating effect, while a large amount spoils the mantle. For all practical purposes, a Daylight mantle would be a powerful commercial rival of the Welsbach mantle, albeit not of quite so high quality as an illuminant.

Hence arose a nice point of construction for the Judge. It could not be seriously maintained that the mere separation into a distinct process of manufacture of the application to an incandescent mantle of one of its activating substances, constituted such an improvement in this case that a patent for it was sustainable. Consequently the question was narrowed down to the curious inquiry of whether the language of the Welsbach patent specification of 1885, referring to cerium, covered what was done by the defendants in applying the later discovery of the beneficial effect of a very small proportion of cerium. Was the employment of cerium at all of the essence of Welsbach's invention? Did not the words of the specification, admitting the suitability

for the inventor's purpose of "cerite earth containing no "didymium and but little cerium," imply that the cerium was something to be avoided? Professor Dewar's evidence was very candid upon this point. As we reported him (*ante*, p. 665), he said that he had thought Dr. Welsbach to mean that as much of the cerium as possible should be removed from the cerite earths, if they were used. "There "was nothing to suggest that it was any advantage to leave "a little cerium in." Sir William Crookes agreed; adding that, in working this patent as described, he should get rid of the cerium so far as was possible, but it was difficult. It was not until 1893 that Welsbach himself disclosed the fact that a very small proportion of cerium was useful. We have not the slightest hesitation in averring that upon this evidence the lay mind would incline to the opinion that the later specific employment of a very small quantity of cerium for attaining the described object did not come within the natural meaning of the words of the 1885 patent. The point was very fully considered by Mr. Justice Byrne, who concluded, in the opposite sense, that the permissive employment of "but little" cerium by Welsbach in 1885 covered the preferential use of a small quantity of cerium for a reason subsequently discovered. We have no doubt whatever that the learned Judge's construction is the correct one. Welsbach patented the manufacture of his mantle substantially as described; and the fact of his not knowing all about every one of the substances he specified as suitable for use, is no invalidation of his claim. This is a striking illustration of the application of the judicial mind to distinguish the right in a complicated technical matter. Several leading cases might be cited to strengthen the lesson, which all inventors ought to take to heart. In the case in point, the first patentee saw no objection to the use of a little of a named substance. A later worker sees a very great advantage in the same use; but the earlier "bird" had already appropriated that "worm." He says so plainly; and there is no getting over the words. If he had objected to the substance altogether, anybody else would have been at liberty to use it. Patents would hardly be worth taking out, if every patentee were required to be omniscient. This is the moral of the present case; and it is one of comfort for inventors of real novelties. For the rest, the Welsbach Company are to be congratulated upon their good fortune in possessing so sound and tough a master patent.

The Inquiry into the Charges of the London Gas Companies.

On Thursday last the Select Committee of the House of Commons appointed to inquire into the powers of charge of the Metropolitan Gas Companies began their work. We give a special report of the proceedings in our "Parliamentary Intelligence." No Counsel are engaged. The witnesses examined on the first day were Sir Courtenay Boyle, for the Board of Trade, and Mr. H. E. Haward, the Comptroller of the London County Council. Sir C. Boyle acquainted the Committee with the history of the London Gas Companies subsequently to the memorandum of Sir T. Farrar, published in 1876. This witness gave a luminous account of the amalgamations and other arrangements which have produced the existing state of things, and resulted in the present inquiry. He told the Committee that dissatisfaction with the differential charges of The Gaslight and Coke Company north and south of the Thames was the originating cause of the trouble; but he was most diplomatically reserved as to any suggested ameliorations. Indeed, the Board of Trade are represented as being satisfied with the existing regulations, with the Referees, and with most other features of the settlement of the question of London gas. The Permanent Secretary was doubtful as to the righteousness of the reserve fund arrangements operating in the case of the London Gas Companies; but he was not in a position to offer any definite propositions for reform of the Companies' finance or anything else. He did not profess to understand the difficult question of gas testing, and talked generally with bated breath of the whole subject. The examination, such as it was, degenerated at last into a sort of pointless conversation about nothing in particular. Mr. Haward put a little more life into the proceedings. This witness entertains views, which he was not afraid to express, respecting the character of the bargain by which the old London Gas Company's district came into the possession of The Gaslight and Coke Company. He impugned the sliding-scale as it is applied by the Metropolitan Gas Companies, and endeavoured to impress it upon the Committee that the consumers would have been better off without it. A novel point was brought out—that by this system the ordinary proprietors become preference shareholders; the consumers being the ordinary shareholders. It was also shown that, whereas in all the Chartered amalgamations the moving Company were in a worse position than the absorbed undertakings, in the case of the South Metropolitan Company the opposite condition prevailed. Mr. Haward impeached The Gaslight and Coke Company for dividing more than they earned in the years 1895, 1896, and 1897—in this regard following Sir Courtenay Boyle, with a difference. The witness's evidence was not concluded when the Committee adjourned for a week; but he appeared to have considerably enlightened the members, so far as his work went. The investigation promises to be very interesting.

The Eastern Counties Association Meeting—The Attendance of Trading Representatives.

The improvement in the attendance of members at the meeting of the Eastern Counties Gas Managers' Association on Wednesday justified the resolution of last September to change the locality of the Spring meeting, by way of trial, from Peterborough to Cambridge; and therefore it may be expected that, until there is some good reason for an alteration, the April meeting will continue to be held in the latter town. There were two papers for discussion on subjects upon and around which any gas manager who takes something more than a supervising interest in each and every piece of apparatus on his works can profitably detail his experiences. The first paper was by Mr. T. A. Guyatt, of Ely; and it dealt with the hydraulic main and its fittings. Its principal purpose, however, was to introduce to the members the arrangement which Mr. C. C. Carpenter has so successfully applied to the Vauxhall and Bankside stations of the South Metropolitan Gas Company, and by which he secures three things: (1) The support of the hydraulic independently of the brickwork of the bed; (2) the sealing of every dip in an equal depth of liquor; and (3) an overflow by which the tar is drawn off as soon as it is made. What greater commendation can this arrangement want than the statement of the author of the paper that, under this system, and working with the hydraulic mains less than a foot above the beds, Mr. Carpenter has "no difficulty whatever" with that bugbear of most gas managers—stopped ascension-pipes? Though hardly coming within the scope of the paper, Mr. Guyatt also suggested the possibility of being able to produce a special cast-steel retort which would stand under present working conditions, seeing that, with a well-arranged gas-fired setting, the wear and tear on the retorts is so materially reduced. Mr. Guyatt is inclined to think that this suggestion is worth an experiment. Very good; then we would suggest that Mr. Guyatt is a man well qualified to undertake the experiment, and to give to the gas industry the results. The second paper was by Mr. A. L. Clarke, of Maldon, who contributed some notes drawn from his own observations on that ever-fascinating subject, purification. Even at this day, there are many gas managers to whom the actions and reactions which occur in the process of purifying are matters of mystery; and within the four corners of the purifying-box, there is yet a field for further careful research. Papers such as that by Mr. Clarke are required to induce a better and more general acquaintance with this interesting branch of the operations of a gas-works. The two papers were discussed together; and, as will be seen elsewhere, they were successful in drawing from several members their personal experiences. The officers for the ensuing year were afterwards elected. Mr. H. Wimhurst, who took the initiative (with Messrs. Barton and Carter) in organizing the Association in 1888, and for several years served it faithfully as its Honorary Secretary, was chosen to succeed Mr. W. D. Child as President; and Mr. J. G. Hawkins (who, by the way, was not heard on his favourite theme of purification) was appointed to the Vice-Presidency.

After the disposal of the business of the ordinary meeting, the members discussed a question of some delicacy. It is a matter of common knowledge that almost from the origin of the Association representatives of trading interests have attended the meetings. From small beginnings, their numbers have grown until there have been occasions when they have so far outnumbered the members that to call the gathering a meeting of the Eastern Counties Gas Managers'

Association was a misapplication of the title. We cannot blame the gentlemen to whom we refer for this state of things. They have in many instances been invited, and made welcome, by the members themselves; and therefore, if blame attaches to anyone, it is to the members. However, recent occupants of the presidential chair, and other members of the Committee, have recognized that some restriction has become absolutely essential; and it was for this purpose—although not so expressed—that the Committee invited the members to discuss with them last Wednesday two new rules, and certain modifications in the existing ones. The outcome of the conference was the passing of a resolution creating a class of associate members, who are to be "either secretaries or auditors not exclusively engaged in "gas companies' work, directors of gas undertakings, gas "engineers, or such other gentlemen who, by reason of "their scientific or engineering knowledge, shall, in the "opinion of the Committee, be likely to further the interests of the Association as set forth in Rule 3."

The new rule would have been a very good one indeed to adopt at the birth of the Association; but is it so now, under the circumstances which have been allowed to prevail so long? We cannot help thinking it is not, and that it will occasion considerable difficulty. In the first place, it will impose upon the Committee a task which, we fear, they will soon find burdensome, and from which they will wish to escape. By the resolution they have placed upon them the invidious duty of judging whether or not the scientific or engineering qualifications of perhaps several individuals in one particular line of business are such that they may be admitted into the ranks of the Association. For the purpose of example only, take the case of the representatives of the coal-trading firms who have habitually attended the meetings. So far as our knowledge goes, they are all estimable gentlemen; but how many among them are the possessors of "scientific "or engineering knowledge" such as is "likely to further "the interests of the Association as set forth in Rule 3?" Assuming there are among them one or two happy possessors of the necessary qualifications, will the Committee be prepared to recommend that these shall be favoured to the disadvantage—for disadvantage it would undoubtedly be—of the less fortunate ones who have been regular attendants at these meetings? We are afraid it is too late in the day for the Committee to befriend "scientific or "engineering knowledge" in this way, to the detriment of the merely commercial agent. It seems to us that all must go, or none.

The real question the Committee should have considered is this: Have the gentlemen representing trading interests who have made it a practice to attend the meetings ever done anything to assist in furthering the objects which the members set up when they banded themselves into an Association? and which were: "The advancement of all "matters connected with gas engineering, manufacture, and "finance," and the facilitating of "the exchange of infor-"mation and ideas." If these gentlemen have not assisted in forwarding these objects during the ten or more years the Association have been in existence, then what claim have they now to consideration on the part of the Committee? There was one occasion—when the Association were discussing the subject of the standardizing of meter-unions—when the presence of principals and representatives of meter makers was a decided advantage, inasmuch as they were in a position to lay before the members some useful information on the question. Then, those gentlemen were present by special invitation; and no doubt they, and representatives of other branches of the gas industry, would gladly respond to a similar invitation when questions appertaining to their own particular business were to be discussed by the members. Special invitations of this kind are issued by the Society of Arts and by the Society of Engineers, with very considerable benefit all round; and the practice might be extended. The new resolution also embraces the directors of gas companies. No serious objection can be taken to these gentlemen becoming associate members; but is it good policy to try to blend directors, engineers, and representatives of contracting firms in the way suggested? We can, for example, quite imagine instances where, under the surveillant eye of a director, a little friendliness between an engineer and a contractor might some day unfairly both compromise the former and jeopardize a tender of the latter. In our opinion, Rule 2—"that this Association shall consist of engineers, managers, "assistant managers, or secretaries exclusively engaged "upon a gas-works, in the service of gas companies or "local authorities"—was amply expansive; and the gentlemen to whom the new rule is specially directed could have been invited by the Committee to the meetings on occasions when their presence would have been useful. Anyway, in order to make the new rule effective (if effective it can be made), the Committee will have to delete from their notices of meeting the permission to the members to "bring any friend who may be interested in the work of "the Association."

Fire Risks in Town Buildings.

THE occurrence of the Hyde Park Court fire, following so closely upon the terrible Windsor Hotel conflagration in New York, has naturally drawn public attention once more to the fire risks of modern habitations and places of business. An even more disturbing catastrophe than either of those named was that of the Andrewes mansion in New York. So long as a plausible reason—we had almost written excuse—can be shown for an outbreak of fire, with loss of life, the average man does not trouble himself to take the warning to heart. The incurable optimism which keeps the suicide rate so low, operates to assure the average town resident that a similar emergency will not come his way. Yet hardly a week—scarcely a day—passes without bringing its tale of horror of this kind. The Andrewes case was particularly impressive, by reason of the tragic insufficiency then disclosed of all the ordinary precautions against fire. The householder is the Chairman of the New York Steam Heating Company—an undertaking which partly justifies its existence by the fact of its keeping actual fires out of houses. The house was warmed on this principle; and Mr. Andrewes was an enthusiastic patron of fire-preventing construction. The house was fitted with electric light; the staircases were non-combustible; and nothing but metallic lathing was used in the building. In the Hyde Park Court case, it was at first asserted that the electric light wiring was the cause of the fire; but this was subsequently denied. The curious part of the story is that, while electric light wires, gas, petroleum, candles, and other things occasionally give rise to conflagrations, nothing that the wit of man has been able to suggest suffices to prevent them altogether. The wise and prudent, the ignorant and foolish, rich and poor, all suffer in their turn. Meanwhile, there is some force in the complaint of "The Times," that architects do not regard fire risks sufficiently. Something might be said about the unfortunate effect of the modern practice of fire insurance in encouraging carelessness on the subject of fire prevention. It can hardly be doubted that if there were no fire insurance, safe building construction would be much more regarded. As it is, there is only too much truth in the professional humorist's joking about the profitableness of a "good fire;" and the suspicion that an occasional horrifying holocaust is not regarded with disfavour by the insurance offices, is not wholly baseless.

WATER AND SANITARY AFFAIRS.

THE decisive action of the House of Commons last Tuesday with respect to the Metropolitan Water Companies [Government] Bill, affords further proof, in addition to others of recent date, that Parliament is no longer to be trifled with on a subject of this kind. Mr. Stuart, as if thinking to repeat the obstructive victories of years ago, met the motion for the third reading of the Bill by an amendment that it be recommitted. He disavowed any intention to oppose the third reading, but asked for further consideration of a measure which he looked upon as possessing faults of a serious character. So the debate opened which considerably exceeded the quarter of an hour reckoned upon by Mr. Balfour as sufficient for disposing of a Bill which had already passed the ordeal of a first and second reading, as well as that of a Select Committee and a Committee of the Whole House. But the party related to the County Council were resolved to upset the Bill, all the while announcing that they did not intend to vote against it. Members of a Progressive type who represented East London constituencies were caught in the dilemma of obstructing the passage of a Bill which they were obliged to own went directly to the prevention of a "water famine." How could they at once be friends

to the East-end, and maintain allegiance to Spring Gardens? The only plan was to accept the principle of the Bill, and to object to the details—that is to say, to speak against the Bill and to vote for it. Mr. Stuart formulated his demands, which simply amounted to stultifying the Bill under the pretence of amending it. If the Companies wanted a supply of water from one another, they must not attempt anything of the kind without the intervention of Parliament. The authority of the Local Government Board was deemed insufficient. Let us imagine how such a cumbrous procedure would work in a case of emergency such as befell the East London district last summer. The "intervention of Parliament" would have to be invoked at every step; and a Select Committee would have to decide the issue. Clearly there is need for a power ready to act with promptitude in such a case; and the Local Government Board is precisely adapted to render this aid. The Royal Commission foresaw the requirement, and recommended that it would be inexpedient to lay down any complete scheme in the Bill which would have to be passed to render intercommunication possible. It would be better, they considered, to frame "elastic clauses" enabling the Companies to execute from time to time such works as might be authorized by a public department, "such as the "Local Government Board." If it had been "such as the "London County Council," and had this been embodied in the Bill, less might have been heard of "the intervention "of Parliament."

It is perfectly clear that the Government Bill was rightly framed for the purpose it was intended to serve, which was to render the whole water supply of the Metropolis available for all London. The Bill was designed to give a species of perfection to the present system, and that without any help from the County Council. Mr. Stuart was afraid that the Companies would spend too much money. Mr. Chaplin signified that he would take good care they did not. In reply to the demand for a sinking fund, Mr. Chaplin stated what he had said before—that there was nothing in the Bill to call for a sinking fund, and the Royal Commissioners had approved the proposal that there should be none. A curious argument held by Mr. Stuart was that, "dangerous and difficult" as the Bill might be in case of purchase, it would be extremely dangerous in the case of non-purchase. A clause was asked for which should sterilize the power of increasing capital in either case. Mr. Chaplin appealed to the third clause, by which it is provided that the Companies shall derive no advantage, in the event of purchase, from having established intercommunication between their systems. This would seem enough, for nothing of the kind is wanted until purchase comes. But purchase is the great question which dominates the policy of the County Council. To improve the present system of supply, is to make the Companies strong, whereas the Council want to see them weak. Mr. Chaplin had a higher and truer sense of the situation. His supreme anxiety was to guard against any future failure in the supply; and in this feeling the House shared. If there was danger anywhere, it was in delay; and the House would consent to none. Even Mr. Steadman, with all his zeal for municipalization, preferred the Bill to the risk of another "water famine;" and Mr. Pickersgill suggested that Mr. Stuart should not press his motion to a division. In fact, the East-end members were not able to keep up the fight; and Mr. Stuart, taking consolation from the possibility of the attack on the Bill being renewed in the House of Lords, asked leave to withdraw his amendment. This was refused, the amendment was negatived without a division, and the Bill was read a third time. The merits of the measure were so apparent that during the debate, Mr. H. Samuel, of Limehouse, appealed to the House not to sanction the re-committal of the Bill, and thanked the Government cordially for the conclusion at which they had arrived. But Mr. Samuel is a Conservative; and politics of the opposite order prevail at Spring Gardens. In short, we are led to conclude that no institution has more need to be municipalized than the Council itself.

Another "link with the past" was severed last week by the death of Mr. HENRY LOWE, who was for many years a Director of the Birmingham and Staffordshire Gas Company, and who had a good deal to do with the negotiations which resulted in the undertaking being purchased by the Corporation. Mr. Lowe was almost 90 years old; and until a couple of days before his death, he retained full possession of his faculties.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1063.)

BUSINESS on the Stock Exchange again last week was only very moderate in volume; and the hoped-for outburst of activity is still concealed in the future. The business that there was seemed mainly to divide itself into two lines—viz, steady investments in response to the progressive cheapening of money and speculative dealing in copper adventures. Under the influence of the first line, Consols and other gilt-edged luxuries hardened materially. And generally, the alterations in price are for the better, except in Americans, and the tone at the close was firm. The Money Market has reached a point of extreme ease; and appearances indicate that a continuance of ease may be expected. In the Gas Market, there was a marked falling off in business, and a general languor prevailed. Not an issue throughout the list ever awoke to even a moderate degree of activity, and many remained utterly inert all the time. As might be expected under such conditions, not much change in value has taken place. There were, however, more advances in quotation than shrinkages; and the latter are very slight in degree. Of Gaslight issues, the ordinary was never active, and never very strong; the price sticking at about 116½, and no better. The consequence was that the quotation had to come down a point. Perhaps the parliamentary inquiry into the Company's charges which is now proceeding had something to do with this. The secured issues, however, held their own well; and the preference even advanced slightly. South Metropolitan was very moderately dealt in, and was inclined to droop; the closing mark being the poorest of the week. Commercials had only one bargain in the debenture. The Suburban and Provincial group provided only the most meagre business; and dealings were quite devoid of interest. Among the Continental undertakings, Imperial roused up, and reached 228 on Wednesday; but it could not touch this figure again. The others were steady. Among the remoter undertakings, a smart advance in Melbourne 4½ per cent. bonds was the feature; and River Plate had another advance. This makes something like a 30 per cent. rise in three months. San Paulo fell. Business in the Water Companies was of its usual quiet character; and changes in quotation are few and slight.

The daily operations were: Gas opened very quiet on Monday, not much being dealt in except Gaslights. Melbourne 4½ per cent. rose 2, and River Plate ¼. There was no increase to speak of on Tuesday in Gas business; and quotations did not move. Wednesday was perhaps a shade more animated; and Imperial Continental rose 2. In Water, Southwark ordinary was 1½ better. Everything was quieter still on Thursday; and stagnation was only avoided by a rise of ¼ in River Plate. In Water, Kent fell 2. Friday brought no recovery; and prices were only moderate. San Paulo fell ½; but Melbourne 4½ per cent. rose 3. Saturday was not strong, and Gaslight ordinary fell 1; but the preference was ½ better.

ELECTRIC LIGHTING MEMORANDA.

The Timidity of Capital—The Repression of Panics—The Seamy Side of Municipal Electric Lighting.

THE well-known phenomenon of the timidity of capital is being displayed, according to an electrical contemporary, by shareholders of submarine cable companies, who are alleged to be sacrificing their investments for fear of the Marconi invention. Our contemporary very properly asks these people to consider the case of the proprietors of gas undertakings, who were so badly scared a few years ago over the news that the electric light had been subdivided. It is pointed out that notwithstanding this encouragement of "the premature belief that electricity would oust the older illuminant," gas stocks were never higher than they are to-day. This is quite true; and gas shareholders who were frightened into action resembling that of the snakes of Ireland under the influence of St. Patrick, when they all "committed suicide to save themselves from slaughter," have no reason to thank the electrical press for any help and comfort. It is all very well now for this order of journals to confess that the popular belief that electricity would supersede gas was "premature;" but they all sang the same tune at the time. There is hardly a prominent electrician who has not spoken disparagingly of gas as a moribund industry; and certainly the electrical press used to write in this strain with monotonous regularity. Our contemporaries have learnt some wisdom on this head, and no longer jeer at an industry which continues to expand in their despite. They also appear to be awaking to the greater truth that it is part of the duty of responsible technical journals to check the financial consequences of the ill-informed sensationalism of the general newspaper press, by assuring nervous investors that the supersession of one industry by another is always a slow process, even where it occurs.

The timidity of capital is a very great public evil sometimes; and it may at any moment become a nuisance to the administrators of important undertakings. The only possible way of diminishing it is by spreading sound and reliable information, to counteract the disturbing influence of interested or ignorant

newspaper reports. It does not matter what the origin or range of any particular scare may be—whether it is in regard to gas, or telegraphic cables, or anything else in which large amounts of capital are invested. The thing ought not to be encouraged. Scares are not easily manufactured in respect of new ventures; because the speculators know their risk, and are prepared for a few ups and downs. But when the original holders have died out, and the investment has passed into the possession of persons who possibly would never have thought of so placing out their money if they had been consulted, there exist all the elements for the encouragement of panic. If the technical and trade journals are good for anything at all—a debateable question in the case of many publications of the class, strung together without knowledge, and filled out with news cuttings collected without pretence of criticism—then they should approve themselves by reassuring their *clientèle* against scares. The two leading electrical journals of this country are not mere paste-and-scissors compilations; but are really authoritative periodicals competently representing the industry. It is for journals of this stamp to supply and keep in evidence that knowledge for the want of which capital is timid. This is part of the service which we profess to perform for gas capitalists; and we are quite willing to help our electrical contemporaries so far as to join in the warning against the "credulous acceptance of ill-advised and premature forecasts made by men who possess neither scientific nor practical knowledge of the subject." The bearing of this observation lies in the application of it. The gas industry suffered from this injury once; it is the turn of the cable companies now.

It is one of the objects of this column of "Memoranda" to exhibit the seamy side of the electricity supply business. We glory in the fact; because, so far as our knowledge extends, there is no other source of this kind of information open to the ordinary member of a local authority, or small capitalist, who may be tempted to spend public money, or his own means, on a provincial electric light scheme. In the "JOURNAL" for the 28th ult. we showed how the expectation of profit had been the chief inducement to local authorities to undertake electric lighting, and recorded the disappointment of this hope in all but a handful of the largest examples. The current issue of the "Electrician" supplies additional evidence to the same effect, in the shape of analyses of the electricity works accounts of Kingston-on-Thames and Burton-on-Trent. Nobody who knows either of these bustling little towns would think badly of them, as commercial centres. Yet the electric lighting in both places is pretty much of a "frost." Our contemporary remarks of the Kingston undertaking that the accounts for the past year are disappointing, as regards accession of business and financial results. The approach of the demand for electric light to the point of saturation of the district is clearly indicated in the figures relating to the last two years. In 1897, as compared with 1896, there was a decrease of the ultimate deficit of from £1326 to £792, a rise of 34·8 per cent. in the equivalent lamp connection, and of nearly 25 per cent. on the output. Last year the deficit rose again to £1112; while the additional lamp connection was only 29 per cent., and in the output 19·6 per cent. This is still growth; but the ominous sign is the check of the rate of growth before the concern has come near clearing its balance-sheet. The station has been at work for over five years; and, naturally, various repairs have become necessary, and are duly provided for. The undertaking appears well managed; but the fuel costs are exceptionally high, working out to 1·806d. per unit. At Burton, the work is even more up-hill; although fuel is as cheap as it is the opposite at Kingston. The real trouble of both undertakings is want of trade. Neither has made any provision for depreciation; and one is as badly off as the other, so far as the prospect of making both ends meet is in question. The force of economies can no further go in either case; and where the additional revenue is to come from is a puzzle. After an existence of five or six years, it should be possible to see the facts as they are in the case of an electric light undertaking. The eminent consulting electricians upon whose estimates these enterprises were started, should be asked to supply a report upon them, in the light of experience—not by the Municipalities concerned, but by those yet trembling on the verge of similar plunges. At Kingston and Burton the money has been spent; and it is idle to cry over spilt milk. One thing must be said by way of warning. It would be useless to ask the Municipal officers what they really think of these admirable, but disappointing, undertakings. The Local Authorities would never confess their error before the ratepayers; but the figures stand on record for independent judgment. Neither Kingston nor Burton would have gone in for this business as they did if the Corporations had entertained the faintest suspicion of what the condition of affairs would be at the present time.

The Yokohama Water-Pipe Contract.—The contract for the cast-iron pipes for the Yokohama Water-Works has been awarded to Messrs. Favre, Brandt, and Co., of that city, for a Belgian firm of pipefounders. The amount of the contract is 1,006,441 yen, or (say) 81·50 yen per ton. This price is delivered at the water-works, about three miles inland from Yokohama, and includes 10 per cent. Customs duty, &c. The Contractors are being allowed to supply a much thinner pipe than was originally specified—viz., ⅓ inch thick and to stand 225 lbs. pressure.

ACCOUNTANTS AND AUDITORS.

FOLLOWING upon many signs of a healthy awakening and enlightenment of public opinion on the subject of the duties and methods of auditors, the news that the profession themselves are taking steps to set their house in order is most welcome. The Society of Accountants and Auditors have prepared and circulated, with an invitation to criticism and suggestion, a Bill designed, according to their accompanying memorandum, to complete the organization of the profession of accountant throughout the United Kingdom on lines similar to the legal and medical and other professions; and, by the establishment of a Council representative of the principal associations of accountants now existing, and of a register of qualified accountants, to debar any unqualified persons from practising; and, further, by the exercise by this Council of disciplinary powers, to secure the public against the risk of employing unqualified or untrustworthy persons in the confidential relations of an accountant. This Council, it is proposed, shall provisionally consist of eighteen members—fifteen to be elected by the various established institutions, and three (who must be accountants in public practice in the United Kingdom) to be nominated by the Board of Trade, presumably to protect the interests of accountants who are at present outside the recognized ranks of the profession. After twelve months, this Provisional Council is to be increased in numbers to twenty-seven; and it is then to become a permanent Council of Accountants in the United Kingdom.

The Council is to appoint a Registrar, who is to compile and issue annually an official register of persons qualified to practise. It is provided that every person shall be entitled to be registered as a public accountant who proves, to the satisfaction of the Provisional Council, within twelve months after the passing of the Act, that, at the date of its becoming law, he was either *bonâ fide* practising as a public accountant or was a member—*i.e.*, other than a student member—of one of the following bodies: The Institute of Chartered Accountants in England and Wales, the Society of Accountants and Auditors, the Society of Accountants in Edinburgh, the Institute of Accountants and Actuaries in Glasgow, the Society of Accountants in Aberdeen, the Scottish Institute of Accountants, or the Institute of Chartered Accountants in Ireland. A recital of these various names is sufficient to demonstrate the necessity of founding some body more generally representative of the profession. We are inclined to think that the qualification "*bonâ fide* practising as a public accountant" is far too vague and elastic. Unless some more explicit definition be given, it appears to open the door of admission to just those very persons against whom the Bill is intended to afford the public protection—namely, persons assuming the name without possessing the qualifications of public accountants. We frequently see such a description on the advertisement boards of the smaller house agents and surveyors; and it is no use enacting, as this Bill proposes, that no person shall describe himself as an accountant, or as a public accountant, or use any name, title, or letters indicating that he is such by profession (whether by advertisement or otherwise), unless he is registered as a public accountant in pursuance of the provisions of the Bill, if some more exactly defined and stringent standard be not provided for testing the qualifications of applicants claiming the right of registration. We would here suggest as an amendment, calculated to enable the Council to exclude undesirable applicants for admission under this clause, that the words "and qualified to practise" should be inserted after "*bonâ-fide* practising."

Should the Bill become law, no person, except as before provided, will be entitled to be registered as a public accountant until he has passed the examinations to be from time to time prescribed by the Council, and has been admitted to be a member of one or other of the Corporations, Institutions, or Societies, previously enumerated. We do not find in the Bill any intimation as to who will be permitted to enter for the Council's examinations. We should be glad to see inserted a clause providing that these examinations, as distinct from the privilege of registration, should be open to any person desirous of entering. At present, no candidate is accepted for examination by either the Institute of Chartered Accountants or the Society of Accountants and Auditors unless he has been articled to a member of such bodies for five years. This effectually bars any clerks, however competent or experienced, whose ability has been trained and experience acquired by service under the accountants of public companies (who are rarely chartered accountants), from ever entering for examinations, success in which would enable them to produce tangible proof of their capabilities. This we consider to be a very real and unnecessary hardship; and we hope that steps will be taken by the promoters, or, if not, by Parliament, to remedy the grievance. The Bill, besides further defining the duties and procedure of the proposed Council, contains the necessary provisions for the prosecution by them of offenders, and for the removal from the register of persons found guilty of mispractices—similar to the powers possessed by the Incorporated Law Society. It also, finally, contains a clause to the effect that whenever it is provided by any Act of Parliament that any duties thereunder shall be performed by a public or professional accountant, such accountant shall, unless otherwise expressly provided, be deemed to mean a person registered by the Council.

The passing of this Bill, which, with the reservations here made, we think is most desirable, both in the interests of the profession and of the public, would not, of course, necessarily have any immediate effect in the direction of raising the standard of efficiency in auditing; but we trust that one of the first steps taken by the Council would be to make it a mis-practice, punishable with erasure from the register, for any registered accountant to accept the post of auditor to any company which did not provide sufficient time and remuneration for an exhaustive and effective audit of their accounts. In the light of recent disclosures, it is not necessary to argue the necessity for such a provision. It is too much, we fear, to hope that Parliament will at present make it illegal for any person other than a registered accountant to be appointed auditor to a public company. But events are steadily tending in that direction.

FOR THE IMPROVEMENT OF POOR-LAW ASSESSMENT.

THE first report of the Royal Commission on Local Taxation has been issued as a Blue-Book. It deals with part of the subject only, but a very important part; being the valuation and collection of local rates in England and Wales. Lord Balfour of Burleigh is Chairman of the Commissioners; and among the number are included Mr. C. A. Cripps, Q.C., and Mr. E. O. Smith, Town Clerk of Birmingham. The appointment of the Commission dates from August, 1896; and no time was lost in beginning the long and laborious investigation called for by the Royal Warrant. The instruction to the Commissioners was "to inquire into the present system under which taxation is raised for local purposes, and report whether all kinds of real and personal property contribute equitably to such taxation, and, if not, what alterations in the law are desirable in order to secure that result." A "large order," indeed! Though the Commissioners have not yet completed their labours, they have arrived at the conclusion that an alteration in the law for the purpose of obtaining a uniform basis of valuation in England and Wales is a necessary preliminary to any revision of the existing system of Local Taxation; and as such an alteration is independent of any recommendations that they may ultimately make on the general questions of the reference, the Commissioners have deemed it desirable to make it the subject of an interim report. This it is with which we now have to deal.

The matter is first treated historically. It is explained that the valuation upon which the larger portion of local rates is raised under the existing system in England and Wales, is that made for the Poor-Rate. This rate, however, covers other expenses besides the relief of the poor. Two valuations of the same property may be made for the purpose of raising Imperial taxes—namely, one for the Income-Tax, and the other for the Land-Tax. And, in addition, three valuations may be made for the purposes of raising local rates—namely, one for the Poor-Rate, one for the County Rate, and one for the Borough Rate. For the purposes of the Poor-Rate, the rating area is the parish, and the area over which the valuation is made is that of the Poor Law Union. The selection of the parish as the rating area, many people will be surprised to learn, dates from the dissolution of the monasteries in the reign of Henry VIII. Previous to this drastic proceeding, the monastic establishments looked after the destitute poor without the assistance of a compulsory rate; but after their destruction, it was found necessary to take measures for putting pressure on people who obstinately refused to give according to their ability. The Justices were empowered to assess any person at discretion, and commit him to prison if he then made default.

The transition period of mixed voluntary and compulsory poor relief did not last long; and by the Acts of Elizabeth, 1597 and 1601, compulsion was wholly established, and assessments were to be made in the parish. Naturally, the question of fact as to liability soon occupied the attention of the Courts; and as early as 1589 a "leading case" established the liability of non-resident owners and occupiers, and distinguished between the responsibility of owner and lessee. The famous Act of Elizabeth in 1601 practically settled the principle of liability to taxation for the relief of the poor, strictly on a property qualification. It gave no directions for the guidance of the Overseers as to the method or system by which assessments were to be made or rates collected, but merely ordered that occupiers of certain specified properties in the parish, as distinguished from inhabitants there, were to be taxed. This has been interpreted as meaning upon the basis of the annual benefit arising from the property situated in the parish. It also directed that every inhabitant, parson, vicar, and other was to be taxed, but did not specify how or wherefore. Here a difficulty arose, as it was doubtful what should be taken into account in determining an individual's ability to pay. In 1633, a decision was given basing the contribution on the visible estate of the inhabitant in the parish. Later, it was defined "that the property to be assessed must be local, visible, and productive; that it must consist only of the surplus left after deducting debts; and that it must be rated according to the profit produced; and that its nature must be distinctly specified." Consequently, such subjects as wages, pensions, easements, profits derived from labour and talent, profits from money invested or lent elsewhere, and furniture, were exempt. Very curiously, though personal property was generally held as non-taxable, a local custom of rating in respect of stock-in-trade largely prevailed in parts of the South and West of England, where woollen and cloth industries existed.

Though the idea of rating according to "ability" seems to be reasonable and just, the difficulty of applying it in practice has proved insuperable. Consequently the annual value of immovable property, such as land and houses, within the parish, though perhaps not always a satisfactory standard for estimating ability, came to be selected as the most practicable basis for assessing both occupiers and inhabitants to local rates. Yet the liability of personal property to rating, inferred from the law of Elizabeth taxing "inhabitants" as distinct from "occupiers"—and therefore, constructively, upon some other qualification—remained operative, though in abeyance, until 1840. In that year an Act was passed directing the Overseers not to tax inhabitants, as such, on the ground of ability, until the end of the following year. This temporary law has been kept in force ever since by the Expiring Laws Continuance Acts. Thus only a formal proceeding of Parliament every year keeps our rating system from overleaping the bounds of the "hereditament" and catching the resident in any parish by his "ability" to pay! The thought is enough to make a millionaire uneasy.

In 1834, the Poor Law Unions were formed; and ten years later the Parochial Assessments Act became law. This defined the standard for the valuation of the hereditaments rated for the relief of the poor of England and Wales as being "the rent at which the same might reasonably be expected to let from year to year, free of all usual tenants' rates and taxes, and tithe commutation rent charge (if any), and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses (if any) necessary to maintain them in a state to command such rent." This is the Surveyor's Charter. The Act made no provision for compulsorily securing new valuations; it laid down no scale of deductions for the purpose of determining the rateable, as distinguished from the gross, value of properties; and it left the Overseers with large discretionary powers. But this is not all. As the Commissioners remark: "The difficulties of applying the principle of rental value to certain classes of properties and commercial and industrial undertakings, which are seldom, if ever, let or sold, are apparent; and particularly the difficulty of estimating the rental value in each parish of properties extending over a number of parishes—such as railway lines and stations, tramways, water-works and water-mains, gas-works and gas-mains, docks, electric light installations, and telephones." Properties of this nature had never been heard of at the time when the parish was selected as the unit of area for the purposes of assessment and the levying of rates; and some of them were not in existence at the time of the passing of the Parochial Assessments Act, 1836, or even of the Union Assessment Committee Act, 1862. Many Bills have been introduced into Parliament from time to time to promote uniformity in valuation, and to lay down a scale of maximum deductions from the gross value for ascertaining the rateable value; but the only scheme of the kind which has become law is that of the Valuation (Metropolis) Act, 1869.

The Commissioners make a connected story of the arrangements and procedure in respect of assessment outside the Metropolis, and the ten other places in England and Wales which constitute exceptions to the general rule. There is no necessary time appointed for the preparation of a valuation list; and the Overseers may prepare a supplemental list whenever they think fit, or are moved to do so by any ratepayer. Neither the Overseers nor the Assessment Committee have power to obtain information from owners or occupiers. Only in the event of an appeal to Quarter Sessions, and by order of the Court, can a person be appointed to enter upon and survey the property. Appeals can be brought under various statutes. Particulars are given of the systems of valuation for the purposes of the County and Borough rating; and the operation of the Valuation (Metropolis) Act, 1869, is described. It is pointed out that the maximum deductions under the Act are invariably allowed—which leads to inequality of rating between properties. All this part of the report is a compendium of the law and practice of valuation, assessment, and rating; and accordingly the Blue-Book must be included in every gas engineer's reference library.

Mr. Gomme, Statistical Officer of the London County Council, states that the Act of 1869 has had the effect of bringing up the assessment of the Metropolis to a much higher standard than that existing in the rest of the country. Other authorities, though advising the amendment of the Act in certain details, have recommended that the general principles should be extended to the rest of the country. This observation is enough to send all persons interested in rating to the Act which is thus proposed as the model for future legislation. All the witnesses who have been heard by the Commissioners have concurred in the view that uniformity, equality, simplicity, and economy should characterize any system adopted for the valuation of properties. They have also agreed—and the Commissioners "entirely concur in their opinion"—that outside the Metropolis these conditions are not to be found. A general desire has been manifested for one valuation authority, working upon one system, and making a single valuation for all purposes, both Local and Imperial. There is no reason against it. Actually, outside the Metropolis five independent valuations may exist contemporaneously in the same area; while there is no limit of

time for the working or operation of any list, no uniform scale of deductions, and no security that assessments should be fair as between different descriptions of property. The Courts of Sessions are objected to as unsatisfactory tribunals for hearing highly-specialized assessment appeals. A special authority, like the Railway Commission, is suggested for the purpose.

Various proposals, mostly contained in abortive Bills, for the amendment of the law and practice of rating, are enumerated and passed in review. It is observed that some witnesses have offered suggestions for the creation of new valuation areas. After discussing all of these, the report concludes with a list of seventeen suggestions for improving valuation, whereof the last is as follows: "That special properties—such as railways, canals, mines, tramways, docks, telephones, and gas, water, and electric light works—should be valued in the first instance by a valuer appointed by the Valuation Authority; objections being heard by that Authority, and appeals lying to the Railway Commission, or a special tribunal created for that purpose." In an appendix to the report appear some pointed observations and opinions of Mr. George Livesey, Mr. C. C. Smith, of Southampton, and Mr. H. E. Jones respecting the unfairness of the existing system of assessing gas-works.

A NEW COKE-BURNING GRATE.

Speaking at a meeting of the Tottenham and Edmonton Gas Company some little time ago, Mr. Corbet Woodall observed that gas companies had neglected their opportunities in the matter of encouraging the domestic consumption of coke as fuel. It took a good deal of incitement to establish among gas companies generally the custom of breaking coke for household consumption; and with this effort they have remained content. With a reserve which is characteristic, the interest of the English gas manager in coke has stopped when it passed out of the works. He has not deemed it part of his duty to follow it up, and see if he could assist the user in burning it to the best advantage. The Continental gas manager has perforce acted very differently by his coke. The question of household fuel is very much more acute on the Continent than it is in this country; and a population accustomed to the use of close stoves for burning charcoal was comparatively easy to educate to appreciate coke. Still, something had to be done to popularize coke; and of all the Continental Gas Companies that undertook this task, the most successful was the Paris Company. It is a curious fact that the Parisian populace owe their first introduction to the nearest equivalent to the Englishman's "cheerful, open fireplace," to that Company's coke-burning grates. Thus, in the endeavour to encourage the household burning of coke, the Paris Gas Company actually approximated very closely to that domestic appliance which in England has proved the chief obstacle to the same fuel—the open grate.

A brief examination of the Paris Gas Company's coke-grate will reveal both its resemblances to, and its differences from, the ordinary English fire-grate. The former has been exhibited and offered for sale in this country; but it has never taken well with the British public, for a variety of reasons. Its general appearance is unlike that of the more fashionable type of grates. It does not exhibit that extent of fire-brick which the British public have learnt to look for in an economical grate; and it necessitates a moveable blower. Moreover, the fire-grate is very much exposed, being basket-shaped; and all the dust of the burning coke falls out in front, and shows itself on the hearth.

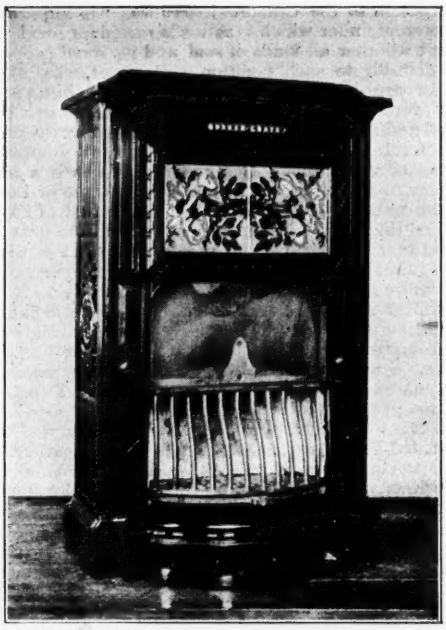
It is undeniable, however, that the Paris grate answers its main purpose of burning coke quite well with the aid of an ordinary chimney and a blower. It is instructive to note why it does this; and the inquiry will show inferentially why the ordinary English fire-grate, which is adapted to burn the good English coal, does not answer with coke.

First, then, the Paris grate is of large capacity, and deep. The front bars are vertical, and the egg-shape of the fire-basket facilitates the continuous falling together of the fuel. The English grate, whether the old-style "sham register" or the new "Country Parson's" type, is broad and shallow; and the shape of the fuel-holding portion has no reference to the falling together of the fuel. Put as succinctly as possible, the English coal-grate invites the poker; while a successful coke-fire must dispense with this implement.

Most ordinary grates can be adapted to burn coke with fair success by the simple expedient of increasing the depth of the fuel-bed, which is easily effected by putting a bit of wirework behind the front bars, rising as high as convenient. There still remain, however, the chief housewives' objections to a coke-fire in a common type of grate. These are as follows: "While the fuel is fresh and clean, and the whole is warmly aglow, everything is nice and bright. So soon as the fire begins to burn low, matters change very quickly for the worse. The remaining coke gets dusty and dirty-looking; and if you poke it, you put the fire out. Once down, the fire is difficult to revive with coke alone; and it *does* smell so sulphury, and make such a mess in the room!" Obviously, no mere alteration in the depth of the fuel-bed will suffice to remove these objections to coke, some of which, it will be seen, apply to the French grate as well as to the English type.

As regards the reviving of the fire when it has been allowed to burn low, this can, of course, be done by the help of the sliding or hinged blowers now so often attached to modern-style grates. Blowers or "canopies" are equally efficacious in working up a dull fire. But, unhappily, a grate with a closed blower becomes a "stove;" and a stove the British householder will not have in his living-rooms at any price. The temporary use of a blower is permissible; but when it is down, the whole of the top of the fire is shut out from view, while it usually makes the contents of the grate roar away up the chimney in no time. Hence, the attempt to burn coke or anthracite in a grate with a blower means the incessant opening and shutting of the front of the fireplace, which soon becomes regarded as a nuisance; and the coke is thereupon left out of the scuttle.

Yet the fact remains that coke is the cheapest and most efficient fuel for every household purpose where the "cheerful, flickering blaze" and the enjoyment of poking the fire are not the first considerations. The circumstance of its being smokeless is not to be forgotten; although this does not weigh much with the householder, whom the Smoke Prevention law does not touch. The vast and growing popularity of gas fires and warming-stoves proves that there are many domestic uses which the coal-fire does not entirely and exclusively fulfil. On the other hand, the gas-fire is not a cheap means of heating upon anything like a considerable scale, or for a lengthened period of daily use. For a strong heating effect and long service, there is nothing like coke; and here also its economy becomes conspicuous. Where appearance is no object, there are several makes of coke-stoves which answer very well; but how combine the brightness of the open fire with the cheapness and steadiness of a coke-stove?



It is claimed that all requirements are satisfied, and all objections to the burning of coke for house warming removed, by the grate of which we give an illustration herewith from a photograph. It is called the "Quaker Grate" (Webber and Price's patent), and is manufactured by Messrs. Richmond and Co., Limited. One pattern is made after the general shape and style of a gas fire-grate, so as to be adaptable to existing fireplaces with the least amount of trouble. It is also made in other patterns; but the one shown is the highest grade.

This grate embodies several principles of the first importance. The successful burning of coke with any chimney is assured by the provision of a sliding blower of wire gauze over the fireplace. Unlike plate blowers, this wire gauze permits the fire to be seen at all times. Indeed, its presence can scarcely be detected without close inspection (it is shown pulled down in the photograph); while it acts more gently than a solid plate. Sufficient air passes through the meshes to keep the wire gauze cool, and at the same time to preserve the ventilating effect of an open fireplace.

A rocking bottom-grate, actuated from a lug in front, serves to keep the fire clean, and obviates poking. The "tumble-home" shape of the front of the grate assures the cleanliness of the fire, inasmuch as the dust falls down *inside* instead of out, into the ash-pan placed to receive it. For cleaning out the grate, the whole set of the front bars comes away. Hence there is no escape of dust into the room. Air-warming flues on each side increase the effectiveness of the grate. Such a combination of points of good coke burning has not, we believe, been put upon the market before; and it remains to be seen whether the "Quaker Grate" will enable gas companies to remove Mr. Woodall's reproach. Last, but not least, among the merits of the grate is claimed to be its efficiency as a cure for smoky chimneys. The Quaker Grate is now being shown in the "Smoke Abatement" annexe of the Building Trades Exhibition at the Agricultural Hall, Islington, which remains open until May 6.

PERSONAL.

Mr. C. V. BENNETT, of Wells (son of the late Secretary of The Gas Institute), has been appointed Manager and Secretary of the Felixstowe Gas Company—a position recently advertised in the "JOURNAL" under No. 3234.

Mr. ERNEST W. DREW, who (on the retirement of Mr. Alfred Lass) undertook temporarily the secretaryship of the Barnet District Gas and Water Company, was last Friday permanently confirmed in the appointment. Mr. Drew has for many years been with the firm of Messrs. Alfred Lass, Wood, and Co.

On Monday last week, about fifty gentlemen dined at the Windsor Hotel, Glasgow, on the invitation of the Committee of the Scottish Section of the Society of Chemical Industry, for the purpose of meeting Mr. GEORGE BEILBY, the President. Professor G. G. Henderson presided; and, in proposing the toast of the evening—"The President of the Society of Chemical Industry"—remarked that the roll of Past-Presidents contained the first names in the chemical world of this country. He felt satisfied, however, that the Society had never had a President who had more fully justified his position than Mr. Beilby. From every point of view, as a chemist and chemical engineer, the President had well deserved the credit he had obtained. The toast was heartily received; and Mr. Beilby responded.

NOTES.

The Bryant Oil-Engine.

A remarkable application of the phenomenon of the heating of air by sudden compression to the working of an oil-gas engine is made by Mr. C. H. Bryant. According to a report published in the "Engineer," the Bryant motor is of very simple construction. The essential principle involved is the gasification of the charge of oil by the heat of compression of a suitable quantity of air to make the working mixture. The phenomenon itself, of course, is well known; but we are not aware that it has previously been turned to industrial account. In the Bryant engine, a combustion chamber for the oil and air is fitted at the back of the working cylinder. It is unnecessary to explain the details arrangements for presenting the charge of oil—common kerosene—to the compressed air. Suffice it to say that this is done by the aid of a spray; and the air is compressed so that it becomes hot enough to vapourize and even fire the charge. To start the engine, all that is necessary is to apply a blast lamp to the outside of the combustion chamber, and, when it is hot enough, turn the engine once round. It seems remarkable that sufficient heat can be obtained in this way; but it should be remembered that disastrous explosions have ere now been produced by admitting compressed air suddenly into greasy pipes. It is reported that a Bryant motor has been successfully adapted to a river launch. The inventor claims that he gets ignition and expansion at a comparatively low temperature, without shock. More exact information is desirable on this and some other practical points; since, if the inventor's claims are justified, the motor seems likely to prove a better oil-engine than anything in the market.

Testing Gas Liquor for Ammonia.

Herr Lubberger describes in the "Journal für Gasbeleuchtung" a simple process for ascertaining the quantity of ammonia in gas liquor. This, the author remarks, is usually done in gas-works by means of the hydrometer; but the test is rendered fallacious by the inequality of the action of ammonia in solution. In 1883, Knublauch suggested a rapid method, in which lime was added to the liquor, previously diluted with five parts of water. The mixture was then filtered, and the filtrate titrated with normal acid. The method was, however, vitiated by the action of phenols. The author observes that, as the ammonia dissolved in gas liquor is present chiefly as ammonium sulphide and carbonate, it can be estimated by direct titration with acid. The proportion of ammonia which is "fixed," on the other hand, requires distillation with the addition of lime; and as it forms a very small proportion of the total, it occurred to the author that the quantity may be fairly constant, even with different percentages of total ammonia, in samples from the same gas-works, but taken at various periods. This assumption was confirmed by the results of a large number of analyses; and it is therefore proposed to determine the quantity of fixed ammonia for any gas-works in about eight samples taken at various times. The average would represent the amount required to be added to the percentage obtained by direct titration. For the estimation of ammonia in the spent liquor of sulphate apparatus, it is recommended that three pieces of pure lime of the size of a nut should be introduced into a flask of 400 c.c. capacity, which is then to be half filled with hot spent liquor from the still, and the mixture shaken. It should assume a dark-brown colour. When all the lime has been slaked, the mixture is cooled, and 50 c.c. filtered into a graduated flask. This is transferred to a beaker, and titrated with semi-normal hydrochloric acid until the brown colour suddenly changes to pale yellow. From the total acid consumed, the amount required to saturate the lime in 50 c.c. of solution is deducted. The remainder then represents the quantity of ammonia in the spent liquor. One cubic centimetre of semi-normal acid corresponds to 17 grains of ammonia in 100,000 parts, when using 50 c.c. of spent liquor.

The Importance of Sufficiently Depreciating Plant.

In all discussions of municipal trading, the weakness of local authorities upon the important point of allowing sufficiently for plant depreciation always comes to the front. The "Engineering Magazine" has referred to this question several times of late, in connection with various departments of public works. One of the most important of the cares of a modern works manager is to keep his plant up to date, while getting the utmost value out of it. Formerly there was little difference observed between the terms "wear and tear" and "depreciation;" and at the present time in municipal circles the distinction is not perceived. In untrammeled business, however, much good and sound plant is thrown away long before it begins to be worn out, simply because the owner recognizes that he cannot afford to go on using it in competition with his rivals equipped with newer and more efficient machinery. It is recommended that machinery users of all classes should reconsider their position with regard to depreciation; so as to abandon the idea that a piece of plant built to last, say, ten years can be kept so long by dint of using it with care and diligently repairing it. Rather should the user be ready at any time to "scrap" a machine if he can get a better one to take its place. Municipalism cannot be depended upon to act in this enlightened spirit. Hence the natural fear lest the indefinite expansion of this system of trading may tend to arrest mechanical progress. The "Engineering Magazine" records an example of heroic action of the kind in question, in the case of a Washington cable tramway. This line, less than four years old and in perfect working order, has been replaced by an electric conduit system, simply on account of inability to compete with neighbouring electric railways. "It is likely that the question of depreciation, when it was originally considered with reference to this plant, did not contemplate the absolute decay of the installation, as a money-earning investment, in so short a time. It is precisely the same phase of depreciation that is so often neglected." In England, the municipal idea is to extinguish this risk by quelling competition.

Another Automatic Gas-Lighting Burner may be expected to be brought into prominence very shortly—in company promoting circles, at all events. It is the invention of a M. Rosinski, whose two patent specifications were abstracted in our columns on Sept. 27 and Oct. 4 of last year, pp. 700, 757. A paragraph (evidently inspired) appeared in the "Financial News" last Saturday, which said: The lighting device represents the advantage of compactness, and can be readily adapted to existing fittings. By merely turning on the gas to the burner, M. Rosinski's invention permits a material to become incandescent by gas contact from a branch passage which directs a current of gas on to the material. Upon the ignition of the jet of gas, a tube becomes heated—having one end closed and the lower end open. It contains mercury and a volume of air which, under the action of the heat of the pilot light (causing a bulb placed at its lower end to expand), has the effect of shutting off the gas supply from the branch passage to the pilot light, but not before a small lever has been raised simultaneously, which touches a cone valve controlling the gas supply to the main burner. This, raising the lever, admits the gas to the burner, which is at once ignited by the pilot light just before the latter slowly disappears, owing to the automatic withdrawal of the gas supply from the branch passage by the expansion of the bulb, as already explained.

Carbide Patent Litigation.—According to "Engineering," an interesting patent case has recently been decided at Leipsic; and its result is expected to have a material bearing upon the carbide industry in various countries. It is hardly necessary to recall the circumstances connected with the discovery made almost at the same time by Moissan in France and Willson in America. The former was a scientist who did not realize the practical importance of his discovery; while Willson at once had it patented in America, and subsequently attempted to patent his method in Europe. Here he, however, found himself forestalled in various countries—France, Germany, &c.—by Bullier, Moissan's assistant. In Germany, the fact of a man who was not the inventor having secured the patent caused much annoyance; and several protests were lodged against the validity of the patent. Among the firms and people protesting were the "Deutches Gold und Silberscheideanstalt" and Willson. The Bullier German patent had in the first instance been sold to Messrs. Siemens and Halske and others; but they soon parted with it, and it eventually passed into the hands of the "Allgemeine Elektricitäts-Gesellschaft." In the first instance, the patent was declared void; and this decision has now been confirmed by the Leipsic Court. Among the countries likely to benefit largely by the German market thus becoming an open one, Sweden holds a prominent position. By this autumn some 5000 to 6000 horse power (water power) are expected to be employed in the manufacture of carbide; and during the coming winter, installations requiring a further 3000 to 4000 horse power are expected to be completed. Although the consumption of carbide in Sweden itself is on the increase, Germany will, no doubt, for some years to come prove the greatest buyer of Swedish carbide; and the Leipsic decision is likely to give additional impetus to the Swedish and Norwegian carbide industry.

COMMUNICATED ARTICLE.

EXPERIENCES WITH THE INCANDESCENT GAS-LIGHT.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

(*Concluded from p. 973.*)

When the new pattern Welsbach burner was put upon the market, one of the advantages claimed for it was that the use of a pressure regulator was not necessary; whereas that appliance is almost indispensable with the old pattern "C" burner. To some extent this is correct, and the regulator is not a necessity on every burner. But it cannot be dispensed with altogether. Many of the new pattern burners exhibit a remarkable tendency to "roar," as we are accustomed to say in regard to flat-flame burners; and this disposition appears to be accelerated when a glass bulb is used to protect the burner. The cause of this annoyance is simply excess of pressure, and is particularly evident on the leading mains or at the higher levels of the district. Commencing with the slight hiss similar to that emitted by some gas-fires, a little increase of pressure leads to a decided "hum," and a further increment produces a hooting that may be loud enough to cause great annoyance. In some few cases, a gas-lamp has been found to be extinguished in the morning; and a neighbouring resident owns to having turned it off to stop the noise. The burner may be perfectly silent during the evening, while the full draught is on the main, but commences singing as the consumption falls off toward midnight. Various sized nipples are supplied by the Welsbach Company to suit different pressures; but this does not meet the case of lamps that, by reason of their location, are subject to wide variations of pressure. At Salisbury, about 5 per cent. of the total number fitted on the street-lamps gave trouble on this score; but in all cases the attachment of a pressure-regulator has proved to be a cure. As regards inside burners, there has been no advance beyond the hissing stage; and in either case the trouble is more marked with No. 4 burners than with the smaller sizes.

Another matter that gave some trouble for a few weeks, until the cause became clear, was that certain lamps were found to be extinguished by shutting off the tap during the night. There were dark hints of foul play; and someone remembered having seen a man who had recently been discharged from the gas-works in the vicinity of one of the lamps in question. Then two lamps adjoining each other in a main thoroughfare were seen burning as usual at 7.15 p.m., and found with the taps turned off at 7.45. This only happened on stormy nights, and with lamps in exposed positions. A chopping wind, an unnecessarily long chain, and a loose tap were found to be the conditions necessary for this curious result to obtain. The wind set the chain swinging with sufficient momentum to gradually close the tap. Sometimes the tap was only partly shut off; and the lamp being reported as out of order, was found to have turned itself on again, and have nothing the matter with it when the inspector went round. Cases were also recorded where the lamps repeatedly went off and on again. As with other troubles, the remedy was simple. If the chain was shortened, so that the ring was pulled close up to the lantern when the tap was open, all trouble ceased.

The adjustment of the flash lights is a matter calling for care, in order to secure the golden mean between a flame that will go out on the slightest provocation, or for no apparent reason, and one that tails up the side of the mantle and attracts attention in the daytime. We tried some of the arrangements adapted for use with an ordinary torch, such as climbing flash lights, but without success. In windy weather, especially, the jets on the "climber" were blown out. An illustration in the columns of a French gas magazine shows a climbing light protected by a metal case; but I have not seen this advertised in England. The results of experimental tests in this direction were so disheartening that we did not care to try the special lanterns that are used successfully, I am told, at Liverpool; and time did not admit of further delay, so the order for bye-pass burners was placed. Some few experiments have been made with self-lighting burners for inside lighting; and these have so far given such satisfactory results that I am thinking of trying a dozen in the street-lamps.

In old lamps, the tap previously in use has been left, partly because it acts as a reducing piece, but chiefly because it can be used for adjusting the supply according to the level and situation—care being taken to leave a supply sufficient for the minimum pressure, which frequently obtains about the busiest period of the evening. The tap is also convenient to stop the gas while cleaning the burner, adjusting bye-pass tap, &c.; and has therefore been retained in the case of new lamps. The new taps are of the pattern provided with a side plug of full bore, to be used for dealing with stoppages due to naphthalene or frost. Naphthalene is a very rare visitor with us; and frost has also been scarce since the commencement of the new system. But the gasholder tanks have not required steaming or similar attention throughout the winter, so the burners have not yet been exposed to a prolonged frost.

Some difficulty arises in the first start, or with inexperienced men, about the breakage of mantles while in the act of cleaning the lamps. In regard to this matter the shape of the lantern is of some importance. One that is 16 inches square at the eaves gives the operator a better chance than a 14-inch one, by leaving him more room to work; while a 14-inch lantern is not large enough for a No. 3 or No. 4 burner. Some tin chimneys or protectors were given out for the use of the cleaners at first; but after a little practice they proved to be unnecessary, except for naked mantles. Two out of three of our lamps are now fitted with glass bulbs which serve the purpose of a protector, both in respect to the arm of the cleaner, and to a passing gust of wind.

Having observed the precautions indicated as necessary in the preceding remarks, there is no difficulty whatever in reducing the consumption of mantles to a reasonable limit—well below six per lamp per annum. The cost of mantle renewals is not a serious item. In addition to this there is the burner to be cleaned occasionally; so the cost of maintenance may be put at 5s. or 6s. per lamp in excess of the similar figure for flat-flame burners. Against this there is the saving of gas. A No. 2 new pattern Welsbach burner does not consume more than 2½ cubic feet per hour, or less than half the quantity required to supply a 5-cubic feet flat-flame, which really comes out in practice to nearly 6 cubic feet per hour. On a 3700 hours schedule, the flat-flame burner will require 20,000 cubic feet per annum or more; but the incandescent only just over 9000 cubic feet. So it is quite safe to introduce the new system at a less price than the old; and the authorities will, under ordinary circumstances, be only too pleased to take out the reduction in additional lamps.

Although a higher pressure and increased consumption is attended with an increase of illuminating power, whereas with the ordinary flat flame there is a positive decrease of light, under similar circumstances, the "duty" per cubic foot of gas used is not increased. The best results, so far as economy in consumption of gas is concerned, are shown at about the nominal rate for which the burner is constructed. With a No. 2 burner, adjusted to 2 cubic feet per hour, a duty of 33 candles can be obtained; but if the pressure is increased to give a consumption of 2·75 cubic feet per hour, the illuminating value will be under 80 candles—representing a duty of less than 30. It is important to bear this in mind, because the statement that the illuminating power increases with the consumption has been read as meaning that the "duty" increases, which is a different thing. And some have supposed that the best results are obtained at the highest possible pressure, which is not the case.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Spring Meeting.

The Twenty-First General Meeting of the Association was held last Wednesday at Cambridge, under the presidency of Mr. W. D. Child (Romford). There was an improved attendance of members; and a good programme was carried through in quite a vivacious manner. The members first met at "Ye Olde Castel Hotel," where light luncheon was served; and at two o'clock they assembled in the Council Chamber at the Guildhall for business purposes.

Confirmation of Minutes.

The Hon. Secretary (Mr. J. H. Troughton, of Newmarket) read the minutes of the meeting held at Romford on Sept. 15 last; and they were confirmed.

Report and Accounts.

On the motion of Mr. J. Carter (Lincoln), seconded by Mr. E. W. Smith (Chelmsford), the report and accounts for last year were taken as read. In the former, a pithy sketch of the year's work was given, and a statement as to the membership was made. The number of members at the commencement of the year was 58, and 13 new ones were subsequently elected. The Committee regretted the loss, by death, of Mr. R. F. Paternoster, of Ipswich, three members resigned, and one had severed his connection with the Association under Rule 17. The membership was now 66. The accounts showed that a balance of £38 14s. 5d. was brought forward, and subscriptions paid during the year amounted to £35 14s.; making a total of £74 8s. 5d. The expenditure had been £36 3s. 2d., which left a balance in hand of £38 5s. 3d., and a few subscriptions outstanding.

New Member.

On the proposition of Mr. Troughton, seconded by Mr. H. Wimhurst (Sleaford), Mr. J. H. Duncan, of Melton Mowbray, was elected a member of the Association.

Papers and Discussion.

The President announced that Mr. A. L. Clarke, of Maldon, who had promised to read a paper on "Purification," had been suffering from ill-health during the past three months; and at one time he (the President) quite expected the paper would have to be withdrawn. Mr. Clarke, however, had proceeded so far with it that he had consented to its being read by the Hon. Secretary. He was sorry they were deprived of Mr. Clarke's presence and assistance. This paper and the one to be read by

Mr. Guyatt ran to a certain extent on such close lines that it would enable them to save time if they were both first read and then discussed together.

Mr. T. A. GUYATT (Ely) read his paper, which was entitled—

THE HYDRAULIC MAIN AND ITS FITTINGS.

It is not my intention to enter into the question of whether the hydraulic main is a necessity. In more than one works of considerable size I believe it has been abolished altogether; and many others have in use an anti-dip arrangement. I must, however, confess to a preference for the hydraulic and dip-pipe.

The primary object of the hydraulic main is, of course, to form a self-acting valve with the dip-pipes; but it also acts as a preliminary condenser and washer. It is now generally admitted that a tar-seal in the hydraulic injuriously affects the illuminating power of the gas; and various valves and overflow arrangements, more or less efficient, are in use, with the object of getting rid of the tar as it is made and maintaining a liquor seal.

The practice of having the hydraulic main in long lengths to take the dips from several beds is, in modern works, generally abandoned, and short lengths to take one or two settings are now used. This, with the modern practice of supporting the hydraulic independently of the brickwork, is more costly than the old plan; and some engineers consider that the advantages gained are not worth the extra capital outlay. It is obvious, however, that a long length of main, supported from the brickwork of the beds, must get considerably out of level, and consequently give very unequal seals. While all the beds are at work, this is objectionable, but should one with a light seal be let down, it becomes a source of danger—serious explosions having occurred through the dips having become unsealed. It is, therefore, a very necessary precaution to carefully plug the dips of any bed not in use wherever more than one bed is connected to a length of hydraulic.

Some time ago I read an account of an elaborate arrangement of stirrers and agitators for removing the thick tar from the hydraulic. Such an arrangement could only have been devised on the assumption that it is impossible to prevent the formation of thick tar in this position—a conclusion with which I am very far from agreeing. Formerly it was the universal practice to leave a considerable depth below the bottom of the dip-pipes; but years ago Mr. George Livesey proved that this was not necessary when he introduced the well-known form of "Livesey" hydraulic.

The form of tar-overflow here described, and shown in sketch, was arranged by Mr. C. C. Carpenter, and is used throughout the Vauxhall and Bankside works of the South Metropolitan Gas Company. During the time I was assistant to Mr. Carpenter, I had considerable experience of the advantages of this arrangement, and, therefore, decided to adopt it at my present works.

Briefly stated, the objects to be secured are to have the hydraulic supported independently of the brickwork of the beds, every dip sealed in an equal depth of liquor, and an overflow by which the tar is drawn off as soon as it is deposited. The first of these objects does not call for particular explanation; the method of supporting the hydraulic on girders carried by the buckstaves being well known.

In order to secure a perfectly level and equal seal for all the dips, they are turned in a lathe at each end to a gauged length; and a nick cut with the lathe tool to mark the depth of seal. The lengths of the dips under the flanges are kept approximately the same; but owing to the inequalities of the cover of the hydraulic, it is useless to be very particular about this. When

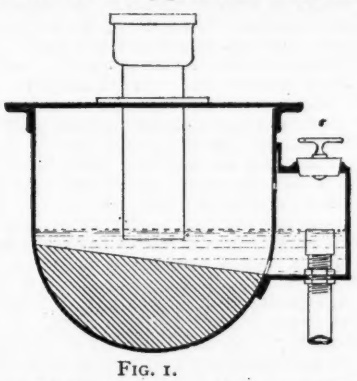


FIG. 1.

putting the dips in place, the two end ones are first fixed, and levelled on top. The intermediate ones are then put in, and levelled to the end ones. Being all of a dead length, it follows that, by this means, the bottom ends of the dips inside the main will be perfectly level.

The tar-overflow consists of a cast-iron box bolted to the side of the hydraulic, with two holes communicating therewith; one at the bottom of the main to allow the escape of the tar, and another near the top to maintain equilibrium. A 2-inch overflow-pipe rises inside the box, with a running socket at the top to adjust the seal; and a plug at the top of the box gives access for the purpose of cleaning. It is desirable to have a small window on the side of the main to show the position of the tar and liquor.

Sketch No. 1 shows a section of a ⊔-shaped hydraulic which I have had partly fitted up with old bricks, floated off with cement, giving a cross fall of 3 inches towards the overflow.

To adjust the seal, the hand-holes on the side of the main are left off, and liquor is run in, to the level of the nicks cut on the dip-pipes, and the running socket on the outlet-pipe from the box is run down to this level. A liquor supply-pipe at each end of the main is provided for the purpose of flushing.

It is useless to pretend that this or any other form of overflow will work perfectly automatically for an indefinite period without attention. The tar-outlet between the main and the box requires keeping clear with a small rake; and I have this done regularly every morning, and the main flushed through with liquor.

It is the general experience that, if there is serious trouble with stopped pipes, the hydraulic main is found to have an accumulation of thick tar in it; and in clearing the bridge and dip pipes a certain amount of obstruction removed from them falls into the hydraulic main—thus making matters worse, and eventually the main has to be cleared out, after which the pipes give practically no trouble for a few weeks. I therefore believe that the formation of thick tar and pitch in the hydraulic is generally a gradual process; and experience shows that the main can be kept clear of it by drawing off the tar at the bottom as it is made.

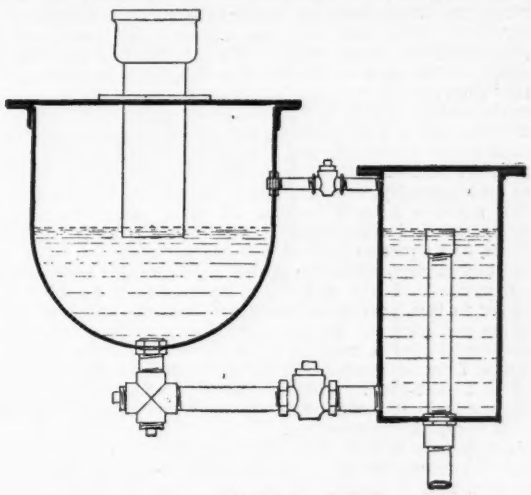


FIG. 2.

Doubtless many will recognize this arrangement of overflow as similar in principle to that shown in sketch No. 2, which is well known. The essential difference is in the length of the connecting passages, which are in this case only ¼ inch long—the thickness of the plate of the hydraulic. In dealing with such a material as tar flowing very slowly, this is an obvious advantage, as tending to avoid stoppages in the connecting passages.

With regard to the depth under the bottom of the dips, a quarter of the diameter of the pipes will give the same area. Therefore, for a 5-inch pipe, 1¼ inches would theoretically be sufficient. I believe Mr. Carpenter allows only 2 inches, which is what I have adopted, and find amply sufficient. This allowance leaves practically no room for thick tar to accumulate, and the whole of the contents of the main are kept constantly agitated by the gas itself—the tar gravitating to the outlet communicating with the overflow-box.

One point which is sometimes overlooked is the necessity for having the hydraulic of ample area. The length is in most cases limited, but not the width; and I consider it a good plan to allow the gas plenty of freedom. It often happens that when a retort-house is being reconstructed the engineer, in order to save expense, will endeavour to utilize what he can of the existing fittings. The modern tendency is to increase the number of retorts in a bed, and adopt regenerative firing. With direct-fired settings a make of 5000 cubic feet per mouthpiece is about an average yield; with regenerators 7000 to 8000 cubic feet, or more, may be obtained, and consequently a very much larger quantity from the same retort-house. Under these circumstances, it is not surprising if the hydraulic main, which worked well under the old arrangement, should be found troublesome under the new, by reason of being overworked.

The distance which the hydraulic is raised above the beds varies very considerably in different works. I do not think it any advantage to have it very high. In a well-ventilated house, 18 inches clear should be quite sufficient. If higher than this, it necessitates longer ascension-pipes which cannot be claimed to be advantageous.

The following remarks hardly come within the scope indicated by the title of the paper; but as the subject is closely connected with it, they may not be considered altogether out of place. The question has often occurred to me, "Are we using the most suitable material for our retorts?" The practice of using clay retorts is now so universal that at first sight the question may appear to hardly merit discussion. Fire-clay is, however, a very bad conductor of heat; and in order to get a temperature approaching 2000° Fahr. inside such a retort, a considerably

greater temperature is necessary in the combustion chamber. Cast-iron retorts were abandoned because they would not stand the higher heats which were gradually introduced. This was before gaseous firing was thought about. I do not advocate going back to the old cast-iron retorts, but suggest that, with a well-arranged gas-fired setting, the wear and tear is so materially reduced that it should be possible to produce a special cast-steel retort which would stand. The initial heat in the combustion chamber might be considerably lower by reason of the metal being a good heat conductor. In support of this, I may instance the Yeadon revolving retort. This has not yet proved a success; but I believe the failure has not been due to any difficulty with the retort itself, which was made of a special steel, and spanned a furnace, quite unsupported, for about 8 feet. If a revolving retort will stand under these conditions, should not a fixed retort, properly supported, be even more successful? I am inclined to believe that the question is worth experimenting on, and feel confident that, given the demand, metallurgists will be able to supply a durable retort.

The Hon. Secretary next read Mr. Clarke's

NOTES ON PURIFICATION.

In the early stages of purification, which is always spoken of, and truly so, as commencing in the hydraulic main, some of the heavy tarry matter and aqueous vapour is deposited, and the cooling process is commenced. We may take it that the temperature of the gas on leaving the dip-pipes is from 120° to to 160° Fahr.; and it is absolutely necessary that, in order to keep the most valuable hydrocarbons in suspension, the cooling process should be very gradual, or the illuminating power of the gas will be materially affected. In order that the cooling process may be gradual—First, the hydraulic main should be of ample size; and secondly, the foul main should be, in the smallest works, not less than 6 inches. In most gas-works of small capacity, we find ridiculously small hydraulic and foul mains; and the consequence is that the gas is subjected to a large amount of friction, and some of the most valuable hydrocarbons are deposited. I do not think that enough importance is attached to this portion of the plant from the point of view of effective purification. In my case, with a make of 17 millions, I have substituted a 10-inch for a 6-inch foul main; and I am sure that I get far more gradual and effective condensation than I did with the 6-inch. I believe that if more attention was paid to the gradual condensation of gas we should hear far less of the eternal naphthalene question.

We may take it that the chief impurities in the gas after it leaves the condenser are carbonic acid, sulphuretted hydrogen, ammonia, and bisulphide of carbon. Now the chief impurity that the washer has to remove is ammonia. As showing the value of efficient condensation, I may mention the fact that, at a temperature of 60° Fahr. with the barometer at 30 inches, water absorbs about 783 times its own volume of ammonia gas, and the lower the temperature of the gas the greater the proportion of ammoniacal gas absorbed; so that the colder the water in the washer the more effectively is gas purified from ammonia. Of course, there is a limit to this, as the illuminating power would be materially affected if the temperature of the gas were allowed to drop much below 50° Fahr.

Along with the ammonia also comes carbonic and hydrosulphuric acids; and although there is not sufficient ammonia to completely neutralize all the acid impurities, one wonders how long before we arrive at the theoretically simple process of adding sufficient alkaline matter to complete the neutralization of these acid impurities and completely purify coal gas in closed vessels. Certain it is that in most gas-works the fact that gas contains enough alkaline to neutralize a large amount of its acid impurities is not sufficiently recognized. The liquor from the hydraulic main, for instance, has come in contact with the gas at such a temperature that a very small proportion of these acid impurities can be in combination with it; the temperature of the liquor there being (say) 150° or 160° Fahr., at which the combining power of the alkali is almost *nil*. If, therefore, the liquor from the hydraulic main and condenser is brought sufficiently in contact with the foul gas, it is capable of absorbing a great deal more of the carbonic acid and sulphuretted hydrogen.

You will see from this that far more can be done in small and averaged-sized works in this direction than at present. In most small works, I believe hydraulic main ammonia is completely wasted. This brings me to another point I wish to particularly emphasize; and it is that by this means the quantity of fresh water used in the process of purification of gas may be very materially reduced, and the resultant liquor be stronger and smaller in bulk—a very necessary thing in small works.

In dealing with the last stage of purification by lime and oxide of iron, I will first state the system we have at our own works, which is to place a good layer of lime at the top of each purifier, and three layers of oxide of iron underneath in each purifier. Then, as each clean purifier is put to work, it is made the last of the series. We are compelled, in some measure, to follow this course, as we have a Weck centre-valve, and can only work the purifiers by rotation. But I think the system has its advantages, because we to some extent remove the sulphur compounds. In the President's address at Romford, last autumn, he stated that he performed his dry purification with "alternate layers of lime and oxide of iron; the boxes being worked on the rotary system." Now, I cannot see that, from a chemical point of view, there is any advantage in the system of alternate layers of lime and oxide. On the contrary—and I speak with all deference—it seems to me, rather, to be wasteful of lime, although, in practice, I have no doubt Mr. Child gets better results than I do. It would, at any rate, be instructive to me if he will give his reasons for such an arrangement.

In a system such as I have named above, the actions and reactions would be as follows—viz., the sulphuretted hydrogen of the foul gas, on entering the first purifier, combines with the oxide of iron to form ferric and ferrous sulphide, and with the lime to form sulphide of lime, while the carbonic acid of the gas passes over the oxide and is absorbed by the lime, forming carbonate of lime. Carbonic acid being a stronger acid than sulphuretted hydrogen, the sulphide of calcium is decomposed, and the carbonic acid passes on to the next purifier. In this way the lime in each purifier is converted into sulphide of calcium in turn, and is then in a fit state to take up the bisulphide of carbon. So that, as this is done at a small cost, purification from the sulphur compounds is within the reach of small works, and is a better system, in my estimation, than simply finishing up with a lime purifier.

In conclusion, I cannot help mentioning how much I agree with the President's remark as to the necessity for a gas engineer to have a good knowledge of chemistry. How much more interesting his work becomes when he understands, if only to a small extent, the marvellous actions and reactions going on hourly under his control.

Discussion.

The President said he did not rise to formally propose a vote of thanks to the authors of the papers; but he wished to thank them personally for having come forward with two such contributions for this meeting. They were sure to give rise to a good discussion, and would be very useful to the members. He thought papers of this description were just what were wanted for the District Associations. Papers which introduced absolutely new methods and ideas—such as that which Mr. Shadbolt brought before the Association some time since, on the "Self-Enrichment of Gas"—should, it seemed to him, be taken to such a body as The Gas Institute, where they would receive the consideration and discussion which such original ideas deserved. But details of construction and manufacture, and even commercial methods, were what they could discuss at District Associations with advantage to everyone attending the meetings.

Mr. R. G. Shadbolt (Grantham) said he was extremely obliged to the President for the kind reference he had made to a previous effort of his in the way of a paper. With regard to future efforts, however, he presumed a paper containing original ideas would not be acceptable to the Eastern Counties Association; but if it consisted of ordinary detail it would be. [The President: No, no; it would be extremely acceptable.] On the subjects before the meeting, he did not think he had much to say, because he found himself somewhat at a disadvantage in not having had the papers before coming to the meeting. This was a very bad arrangement; and he certainly thought it might be improved. He considered that the Eastern Counties Association, though not the largest in point of numbers, might lead the way in this respect in the future, and let the members have the papers a day or two before the meetings. In the case of the paper by Mr. Guyatt, he felt there were a good many things in it which he would like to have thought over before venturing an opinion. Although they might only be matters of detail, they were details of great importance. Mr. Guyatt said that in more than one works of considerable size, he believed the hydraulic main had been abolished altogether; but he (Mr. Shadbolt) did not think there were many in which this had been done. The most successful case on record in dispensing with the hydraulic main had been in connection with the adoption of the steam-jet exhauster, which, however, was not in universal use in this country. There were so many factors which brought about the oscillations in the pull on the retorts, that he did not think the day had yet arrived, or that they had yet arrived at such a state of perfection in regard to the pull on the retorts, when they could do away with the hydraulic main. With respect to the effect of the tar-seal upon the illuminating power of the gas, some twelve months ago it fell to his lot to transfer from an old retort-house, which was direct fired, to a new one on an up-to-date system; and they had substituted liquor-seals for tar-seals throughout. But it was not all "beer and skittles" turning over from tar-seals to liquor ones. To begin with, he had heard it suggested, in discussion at Manchester, that the pulsation of the exhauster might have something to do with stopped ascension-pipes; but this might be a far-fetched idea. He had heard it suggested too that the pull on the foul main was communicated to the ascension-pipes much more readily, and was more sensitive where they had only a water-seal than where they had a tar-seal. He believed there was something in this; and though he had never heard of it being demonstrated, he had thought a good deal about it. Further on in the paper, the writer said, respecting the tar-seal, that it was a very awkward thing where they had a hydraulic main in one length. He himself believed in having a hydraulic to each bed. But the fact of the matter was when they let a bed down with a tar-seal, the tar thickened as the bed cooled; and they got something tantamount to gutta-percha on the end of the dip-pipe. In the

installation of retorts his predecessor had left him to work with, they had a tar-seal; but they never had a stopped ascension-pipe. They got a maximum of 5000 cubic feet of gas per mouthpiece with retorts 8 ft. by 18 in. by 15 in. inside; but they practically had no stopped pipes or liquor-seal from the time they were put in until they were let down. This was worthy of consideration so far as difficulties were concerned. Still, the more they reduced the body of tar, lying thickening in the hydraulic main, or the quicker they removed it, the less likely was there to be cause of trouble when working with high heats. The author of the paper said: "I believe the formation of thick tar and pitch in the hydraulic is generally a gradual process; and experience shows that the main can be kept clear of it by drawing off the tar at the bottom as it is made." With regard to his own experience in putting up hydraulic mains quite recently, he provided first of all for a bottom overflow; but on further consideration, and after consultation with those who had had greater experience than himself in these matters, he cut down the top fender, and let the liquor out first. He thought so long as he did not continue the tar-seal too long, and, through driving at high heats, getting it too thick, he would have equally good results both in economy of working and illuminating power by flushing occasionally, as he would do by running it off quite gradually as suggested. The latter part of the paper interested him very much—viz., that which referred to the Yeadon retort. He himself had had some time ago an idea of testing a steel retort to see what temperature it could be worked at; and he was on the point of trying it when he saw the Yeadon retort. That retort was first made of cast iron, and then a change was effected. It was made in the first instance with blades inside; but when the change was made from cast iron to steel, the retort was made in the form of a corrugated body. A great many difficulties had to be overcome in the working of the retort; and he was afraid they would never achieve what was considered possible in the first instance. After the experiment with the steel retort had been going on a certain length of time, the make of gas gradually fell away until they could hardly get any; and when the thing was taken to pieces, and the body of the retort examined, it was discovered that oxidation had been going on to such an extent, although of cast steel, that the accumulation of deposit was such as to eventually span the space between the retort and the surrounding brickwork, and (the revolving of the retort continuing) holes were rubbed quite through. So that, judging from this experience, they might expect just as much oxidation with steel retorts as they were accustomed to in the use of those made of iron. Regarding Mr. Clarke's paper, he could not help thinking there was a little inconsistency in it. The writer suggested that, if they had in view a gain of illuminating power, it behoved them to condense very gradually; but further on he recommended them to use a direct rush of liquor to the hydraulic and foul mains, so that they might use the ammonia. He (Mr. Shadbolt) could not help wondering what effect that would have upon the illuminating power, drawing on the lines of his first argument. He was afraid that the condensation there would be very sudden indeed. Then the writer, he gathered, said that by adopting so many layers of oxide, his carbonic acid gas was driven forward into the next purifier, and the sulphide of calcium was free to act upon the remaining sulphur compounds. Had he (Mr. Shadbolt) heard this aright? If so, it was putting the cart before the horse. [The SECRETARY read the passage referred to.] That, said Mr. Shadbolt, must be a mistake on the part of the writer. The question of purification was discussed at the last November meeting of the Manchester Institution, so that he would not enter fully into it again. It resolved itself into this: "How far shall I purify? Shall I be content with removing the sulphuretted hydrogen; or shall I go a step farther, and remove the carbonic acid; or a step farther, and bring my sulphur below the Referees' limit of, say, 20 grains?" What they attempted to decide at the Manchester meeting was this: Did it pay? They concluded that it did pay. By using a certain proportion of lime, they forfeited a certain volume of gas by removing the carbonic acid, but they put it on the other end by gaining in illuminating power, which paid them; a step farther they removed the sulphur compounds, but at increased cost. However, in spite of this, one could not consider it sufficiently great to warrant the sending out of gas not thoroughly purified.

Mr. W. J. CARPENTER (Yarmouth) agreed with Mr. Guyatt in his preference for the hydraulic and dip-pipe. In the early part of his career, he (the speaker) had a great deal to do with anti-dips, Chandler's dip-pipes, and so on; and under general conditions, or some of the older conditions, where they did not get up to so great a temperature as now, they could use most of these things. Providing their exhausting arrangements were fairly equal, they could use the anti-dip arrangement; but if they did that which they ought to do, in order to do away with the tarry deposit in the hydraulic main, they brought about that which they tried to avoid—they did not get a dip or a seal or anything of the kind, and, of course, with very high heats, they found a lot of deposited carbon down these arrangements, and did not get anything to keep the gas from coming back from the exhauster. Under all the conditions, the hydraulic main was far preferable. He might say by the way that they had Livesey and Tanner dips in use at Great Yarmouth; and, as Mr. Guyatt said, unless these arrangements were looked after carefully they did not get a liquor seal even with them, but if they were carefully attended to they did, with a greater make per mouthpiece, and not quite so much trouble. In their old system of retorts (as Mr. Shadbolt had remarked regarding his old settings) they had but little bother, but they did not produce so much gas per mouthpiece. But then the price of gas was a little better than now. Consequently the gas was produced under easier conditions; and the manager was not troubled quite so much. Going on to the paper by Mr. Clarke, he said gas managers ought to completely purify their gas in every instance. In his own case, they had made a big effort to have their system of purifiers arranged in such a manner that they could reduce their sulphur compounds at any rate to provincial limits. About 17 or 18 grains of sulphur was their maximum. If the gas was "purified" in such a way that it contained a great deal of certain matter, the difficulties of their distributing staff were greatly added to. One thing he had considerably profited by; and it was this: They looked very carefully to see that the quality of the purifying material was as it should be. At his own works, they had before now accepted material which, when examined, had been deficient in quality. This meant, if used, largely increased expenditure in labour and material through its inefficiency; and moreover in the depth of winter it was not always possible to change it for better material. With regard to lime, more particularly, he had found some of the greatest variations in quality—ranging from 30 to 90 per cent. With 90 per cent. efficiency, see, he remarked, what a difference it made, compared with material of only 30 per cent. efficiency, in the purification of the gas and the lime account.

Mr. W. J. BEST (St. Ives) said that his works had lately been remodelled; and they had put in a new hydraulic main in sections. Speaking from an experience of seventeen years, he strongly objected to his dip-pipes being sealed in tar. He believed in them being in liquor; and, with good exhausters properly regulated, they could make better gas and have no trouble. For the purification of gas, lime, in his opinion, was the proper thing.

Mr. R. BROWN (Cambridge) said he was in the same position as Mr. Shadbolt was when he went to Grantham—that was, at the works of which he had charge at present the benches were of five beds, with one length of hydraulic main. He thought himself that there was something in what Mr. Shadbolt said as to the tar-seal—that it was a very good thing in some cases. But in his opinion, it was because formerly they did not work at such high heats as they did now that they were using inclined retorts. But at the same time he did not think this had all to do with what Mr. Shadbolt said with regard to tar-seals. To his mind it was more to do with what Mr. Guyatt dealt with later in the paper, where he stated that the hydraulic main was sometimes overworked. He (Mr. Brown) found with the old horizontal settings that they never had much trouble with stopped pipes; but when they got on to inclined retorts, with the gas going up one ascension-pipe to one hydraulic main, they were soon troubled with stopped pipes. As Mr. Guyatt stated, with regenerative furnaces, some 8000 cubic feet of gas per mouthpiece was made, as against only 5000 cubic feet with the others. The trouble was certainly due more to the overworking of the hydraulic main than to anything else. He could not agree with Mr. Shadbolt that working with a tar-seal was much better than a liquor-seal; his own opinion being that it was the other way about. However much he (Mr. Brown) agreed with Mr. Guyatt in the early part of his paper, he could not agree with him in the latter portion. That was the most debatable part of the whole of his contribution. He could not at all see that any advantage would be gained by going back to retorts made of any other material than fire-clay. He could not think how it could be, or how they would be able to keep the regular heats they were getting at the present time. Regarding Mr. Clarke's paper, in purification they dealt chiefly with the sulphur compounds. When he was at Hastings with Mr. Botley, they were very successful in dealing with the sulphur compounds; and they worked in this way: They had first two purifiers charged with oxide of iron, followed by four lime purifiers, and then oxide of iron again. He was not able to do this at Cambridge at the present time, because the purifiers were not sufficient; but with the system at Hastings they reduced the sulphur compounds to 6 grains per 100 cubic feet of gas. This statement might be received by some present with incredulity; but it was borne out by the tests of the Gas Examiner.

Mr. SHADBOLT said, with reference to Mr. Brown's remark that he (the speaker) had given a verdict in favour of the tar-seal, he did not intend to convey any such opinion. He simply pointed out that it was not all benefit transferring from a tar to a liquor seal.

Mr. J. BARTON (Peterborough) said he did not quite know what was meant by this liquor seal and tar seal. Was he to understand that in the main in the first illustration it was absolutely all liquor and no tar?

Mr. GUYATT: There is a little tar in the bottom, up to the leve of the overflow.

Mr. BARTON said it must be a mixture of tar and liquor, because if the tar was allowed to remain in the hydraulic main, it became more or less thick. Some time ago, he, like Mr. Shadbolt, changed his system of hydraulic mains to the modern dip. Previously he had the hydraulic main the full length of the retort-bench, taking about five beds of retorts. He had this taken away, and had the main fixed in sections—each section taking a bed of retorts. The tar was run off from the bottom,

and the gas from the top, and it took its own course. They used to flush out these mains occasionally—say, once in 48 hours; and in order to fill the hydraulic main, they pumped in ammoniacal liquor. This went on all right for some little time—at any rate, they had not much trouble with the hydraulics. But he began to have some difficulty with naphthalene on the works and in the district. Such a case he had never heard of before; and he could not quite make out the cause. Moreover, do what he would he could not keep up the illuminating power to the point at which he wanted it. He therefore decided to discontinue the flushing arrangement, and allow the hydraulic main to work the same as the old one did—the gas and the liquor ran together; and the result was they had no further difficulty with the illuminating power, and there was no formation of naphthalene either on the works or in the streets. It therefore occured to him that the flushing-out of the hydraulic main with ammoniacal liquor was one of the causes of the formation of naphthalene. He had not been able to prove this exactly; but at any rate experience had told him it was so. Another thing, when they flushed-out the mains, they had no end of trouble with stopped ascension-pipes; they had the greatest difficulty to keep them clear. In fact, it was hard work to make gas at all; the ascension-pipes were continually blocked with lampblack. But as soon as they discontinued the flushing, and the gas and liquor just ran away together from the sections, they got along very well indeed—the illuminating power was all right, they had less blocked pipes, and no trouble with naphthalene.

Mr. Frank Prentice (Ipswich) remarked that he never heard the words "stopped pipes" without trying to find some valuable "tips;" but what were valuable tips to one man were perfectly useless tips to another. He supposed no one would have the hardihood to say he had found a perfect cure for stopped pipes under all possible conditions. Mr. Guyatt's paper was certainly an interesting one. It seemed to him that, if the author's main sloped from the ends to the middle, he would run a better chance of getting off the thick tar. He imagined that the side box did not run the whole length of the main.

Mr. Guyatt: It is only 5 or 6 inches wide.

Mr. Prentice said he should imagine that, if high heats were used, either end of the main would get pitched up with tar, because of the difficulty of its flowing along to the lowest point of the dip of the concrete bottom, or whatever it was made of. Then Mr. Guyatt said it had been the general experience that, if there was serious trouble with stopped pipes, it was owing to the tar in the hydraulic main being thick. So far as his (Mr. Prentice's) experience went, this was not the reason at all. There were a number of mains in Ipswich now, and very good mains indeed, which were perfectly thin, and had been like oil all the winter. He did not think there was an inch of tar in any of them; and they had had more trouble with stopped pipes in the previous fortnight than he remembered during the last ten or fifteen years. He used to think that, if a main was in a perfectly liquid state at the dead-ends, there would be no stopped pipes; but he was reluctantly compelled to say this idea had been completely shattered like many other hopeful ideas he had possessed in connection with the subject of stopped pipes. Then, again, with regard to the plan of running out the mains, this had been tried at Ipswich very religiously—sometimes as much as twice a day; the idea being to take out a little of the thick tar every day, so as to remove any quantity that would tend to choke up the dip-pipes. But this had not been successful. When the mains were run out, they had to be filled up with something; and probably cold water was used. This tended to set the tar more than anything. With systematic running out every week or two, he found the hydraulic mains stopped up with thick tar, which could not be removed without taking off the ends or the top, which was a difficult proceeding in the winter. The last method they had adopted to keep the mains clear was one which was not perhaps new; but it was an idea of Mr. Jolliffe's, which he found successful. By having a main large enough, and far enough off the stack so that there was no additional heating beyond that given by the gas, and by ventilating the house well both ends and at the sides, the main was kept at such a temperature that it would not get thick. For some reason some mornings, a main would have a liquid seal perhaps, and it would remain so for a week. One side of the house would have liquid-seals, and in a week every one of these seals would be tar ones; while on the other side of the house where there had been tar-seals, they would be liquid ones. He believed the reason was purely a question of temperature. He would advise anyone who was going to put in a new hydraulic main to have it amply large. On the question of purification, Mr. Shadbolt said they were asking themselves how far they should purify. Unfortunately this question was settled for most of them—there was no choice in the matter; they were compelled to do certain things. At Ipswich they were in the tender hands of an Inspector, who was constantly testing against them for illuminating power, and frequently for sulphur and sulphuretted hydrogen. Therefore they could not very well say how much purification work they could do; but they had to do it pretty regularly and constantly, and had to be continually on guard against getting caught. Mr. Clarke's paper was interesting in a way; but he could not follow the arrangement he adopted—especially with reference to the mixing of the lime and oxide in the same purifier. From the paper, he gathered that Mr. Child did the same thing. If lime got mixed with the oxide ever so little, it spoilt the oxide, and the lime too; and if the lime was put in the same purifier, it must get tremendously mixed up after the oxide had been used once or twice, so that it would become practically useless. It was not very clear that this was what Mr. Clarke meant; and he (Mr. Prentice) was in the same fog as Mr. Shadbolt and many others as to the chemical combination which took place, and which enabled him to make his purification complete. He had hoped to hear something on the question of the revivification of oxide *in situ* by air, because this was a matter which he thought would bear a little bit of talking about; and he did think there was a point there which might be taken up by a man who had time and opportunity, and which might yield some good results. The admission of air in the right quantity and at the right place must make the oxide last very much longer; but further than that the point he wished to throw out was this: Supposing they could revivify the oxide of iron *in situ*, thus producing a considerable quantity of sulphur in the oxide, he had strong reasons to believe, although he had no definite figures, that free sulphur in the oxide affected the sulphur compounds, and reduced them. He was subject to correction, and also to any other ideas that somebody else might have on the question. However, this was the line he felt inclined to make a few experiments on himself; but whether they would produce any good, he did not know.

Mr. G. H. Duncan (Melton Mowbray) said as to the point of area in regard to volume, some few years ago it fell to his lot to manage a very small works; and before Mr. Ewing, of Hamilton, rebuilt them, the area of the hydraulic main was so small that it would not take the make of five retorts. But when the area of the main was increased; and its height above the bench raised, they had less trouble and fewer stoppages, which proved conclusively that, as the volume of gas was, so the area of the main must be. Mr. Guyatt had well brought out what seemed to him to be almost like a copy of Hislop's tar-overflow; the principle was identically the same. A great factor in the dip was to have the flow of the liquor and tar almost equal, because if they allowed too big a tar seal, the illuminating power was injuriously affected. If they flushed out the mains, and set the exhauster to a certain point, or stopped it altogether for an hour or so, this had a tendency to regulate the illuminating power. He had found it to be so. In one works with which he was acquainted, the manager always ran water into the mains at the temperature of the retort-house. Regarding Mr. Clarke's paper, one speaker had alluded, with a little scepticism, to the use of lime and oxide in one box. At Portobello and Musselburgh, this system had been in operation for some years. At the latter place, they used the oxide in conjunction with lime. The gas first passed through a layer of lime, and then two layers of oxide. Between the lime and oxide a piece of coarse Hessian cloth was placed; and this prevented the oxide passing through. In conclusion, he asked whether it was a usual practice to pass the gas and the tar together, and what took place after it left the hydraulic? Was it usual to pass the gas from the hydraulic main through the scrubber before the condenser?

Mr. R. M. Couper (late of Newbury) said that he had adopted the plan of having a hydraulic main over each bed. It struck him when he was putting the mains up that he had made a mistake; but before thinking of this, he had ordered the plant. In erecting the hydraulic mains, he thought how foolish it was to have 6-inch ascension-pipes, and yet only a 4-inch outlet from the hydraulic. He was then afraid of the result; but, in experience, he found no difficulty whatever in having a 4-inch outlet from the hydraulic. For four years, with good high heats, but only direct firing, they had no occasion whatever to take off the cover of the ascension-pipes to remove stoppages. This he thought was a point which might be interesting to some of the members who were so very much troubled with high heats. He worked with only a bare ½-inch seal on the hydraulics; and the tar and gas flowed away together through the 4-inch outlet. He had been especially struck with the paper on purification, and the references to the use of layers of lime and oxide in the same boxes. It certainly appeared to him to be a very difficult way of purifying. Personally, he would much rather stick to the use of lime in one purifier and the oxide in another, and have an ample system of purification, than run the risk of having the oxide spoilt by admixture with the lime.

The President said that, dropping his eye down a few notes he had made, it fell upon the two words "How much?" This conveyed a great deal to all of them as engineers; and the whole question really was, How much ought they reasonably to spend to get a proper return for their money by sending out a properly made article. With respect to the question of the hydraulic main, Mr. Guyatt had advocated—receiving general support—the advisability of having a liquor-seal in preference to a tar-seal. For about 25 years he (the President) had been working without either; and he was pleased to say he had done so. He believed he had been less troubled with stopped ascension-pipes than any man in that assemblage. He did not ask them to believe this was due to anti-dips. He stated the facts; and the members might draw their own conclusions. He had used Midland coal, also Durham coal; and there was little difference whether they were using one or the other. This he simply stated as an experience to show they must not say that the fact of a pipe being sealed in tar or liquor was the cause of stopped ascension-pipes.

He himself preferred passing the gas away over the liquor rather than washing it in the liquor. Whatever means were adopted, the liquor must be tarry. The tar and liquor were formed together, and condensed from the gas; and they could not be separated immediately. Regarding Mr. Clarke's paper, the author alluded to his (the President's) address which he delivered at the previous meeting, and the methods therein described as being in use at Romford. He had referred in his address to the works at Romford because the members were visiting them, and not because he wished them to think he was putting them forward as being absolutely model works. He had no doubt they had all experienced the little difficulty of first convincing themselves, and then convincing their Directors, that they had better throw away a lot of plant which had performed useful work, and put in something which was thought to be a little better. Although he had recently built a new works, it was in many senses a question of removal rather than absolutely new construction. It was his duty to make the most of the site, and to do so in the most economical manner possible by utilizing as much of the old plant as he believed would be commercially useful in the manufacture of gas. In setting up these new works, he endeavoured to arrange his plans so that he could obtain from them what he believed would be the best results under the circumstances. Mr. Clarke had spoken of the question of purification by oxide and lime; but he did not look at the description of the first processes of purification. These consisted mainly of washing, in which he (the President) was a great believer. A weak ammoniacal liquor was pumped over the scrubber and from thence flowed into the first washer, so that they were washing the first crude gas with a strong ammoniacal liquor. In this way, they removed a large proportion of the carbonic acid and some of the sulphur compounds. The carbonic acid especially, which would have to be dealt with by the lime, was dealt with in this way. In order to remove the ammonia, he washed the gas again with pure water, and then passed it on to the dry process of purification; and in this way he had only a small amount of the carbonic acid which was originally in the gas to deal with. He always put the material in the purifiers in alternate layers—2 feet of lime in the bottom, and 2 feet of oxide of iron on the top. They might just as well work with deep layers as cutting them up into frivolous layers of 4 or 5 inches; and the thicker ones were really much better to work with. The little question of back-pressure did not occur. The lime being used for a long length of time, and becoming thoroughly carbonated, if it was put in the boxes in a proper way in the first instance, it could be cleared out without admixture. In this way, they effected exactly the same purpose as Mr. Clarke had in view—converting the lime in the first place into sulphide of calcium, because if they got rid of the greater portion of the carbonic acid in the washers and scrubbers, they had very little except sulphuretted hydrogen passing forward to be dealt with by the dry purifiers. Supposing they were starting *de novo* with the lime, and it was then converted into sulphide of calcium, and the remainder went over to be dealt with by the oxide of iron. Running the boxes in rotation, in course of time, the lime became thoroughly satisfied with the amount of sulphur it could take up; and the small proportion of carbonic acid which was still passing on from the washers and the scrubbers displaced the sulphur, and took it through or into the next lime layer in the following box. The lime became thoroughly carbonated; and therefore he did not consider it was wasted. He liked to use a large proportion of lime, because he believed in the thorough removal of carbonic acid from the gas. They were not only benefiting the consumer but themselves. He would put the matter in this way: He had for the past three years been able to manufacture and send out 15-candle gas without any admixture of cannel or other enriching material. This he mainly attributed to the removal of the carbonic acid from the gas. He thought it right to make these remarks, because Mr. Clarke alluded so pointedly to the process described in his (the President's) address.

Mr. GUYATT, replying to the discussion, said he had been much gratified with it. It seemed to be the general opinion that a liquor-seal was preferable to a tar-seal. No doubt, as Mr. Shadbolt said, the tar thickened in the main, and so blocked the dip, and prevented the drawing-in of air there. But the modern tendency was to abolish the tar-seal. There was no doubt that the gas, in passing through the tar-seal, lost some of its illuminating power. With reference to the steel revolving retort, Mr. Shadbolt said difficulties had been experienced owing to the corrugations getting rubbed away; but with a fixed retort this would not occur. He had not himself made any experiments on the point, and had merely thrown it out as a suggestion. He was very pleased to hear what Mr. Shadbolt said about thorough purification, as they had just decided at Ely to go in for sulphur purification, or to take out the rough of the sulphur. Mr. Carpenter agreed with his (Mr. Guyatt's) preference for the dip rather than the anti-dip or other arrangements of the kind; and he was very pleased to hear this. With the old system of direct firing, of course the tar-seal worked fairly well; but could they say the same working with the high heats now in vogue? He believed it was a general experience that there was bother with stopped pipes when working with a tar-seal and the high heats of regenerative settings. Mr. Barton spoke about his trouble with naphthalene and the formation of lamp-black. Of course, the latter was really illuminating power he was losing, and he took it Mr. Barton was running cold liquor into the main.

Mr. BARTON: Not exactly cold.

Mr. GUYATT: It would not be heated to any extent, I take it.

Mr. BARTON: No.

Mr. GUYATT: If you heat the liquor, you lose the ammonia; and if you run cold liquor in, it would tend no doubt to the formation of naphthalene—it would reduce the temperature there.

Mr. BARTON: It was pumped back as it was made.

Mr. GUYATT (continuing) said Mr. Prentice seemed to fear they would be bothered with tar at the end of the main with the arrangement described. The box was simply a very narrow one in the centre. Mr. Prentice also appeared to think they had a mass slipping from the ends to the centre; but, as a matter of fact, they had never had any difficulty with the ends choking up. The 3-inch cross-fall threw the whole of the tar to the lower portion of the lower side of the main, and it flowed both ways; and, flushing it out every day, did not give it time to collect. Mr. Prentice also spoke of the height of the hydraulic off the beds. He (Mr. Guyatt) learned from Mr. C. C. Carpenter the other day that he was now working with his hydraulic mains less than a foot above the beds; and he had had no difficulty whatever with stopped pipes working with this arrangement. Of course, he had the house well ventilated. Mr. Duncan had made allusion to Mr. Hislop's hydraulic overflow. His arrangement was very similar to Mr. Hislop's in principle, he believed; and there was a hood over the top by means of which the seal could be regulated. Mr. Duncan also asked about putting the scrubber before the condenser. Certainly it was not the usual practice to do so. There were cases where they had done away with the condenser, and pumped the gas direct into the washer; but he did not say he should like to do this himself. Mr. Couper spoke about having no difficulty with a 4-inch outlet from the hydraulic. He (Mr. Guyatt) believed that, theoretically, a 2-inch pipe was amply large enough to carry away the whole of the make from the retorts; but, of course, they could not work this in practice—it would very soon get choked up. He could therefore quite understand that Mr. Couper would get the whole of his gas away with a 4-inch pipe. The ½-inch seal wanted looking after; but it could be made to work very well. With reference to the President's remarks as to capital outlay, and how much it was going to cost, that was a question connected with the designing of plant; but, of course, the plant should be kept within moderate dimensions by calculating the work it was going to do. He might mention an instance of which he heard, of a large gas-works where they were actually reducing the size of their purifiers. They put down large purifiers to begin with; and now they were reducing the boxes to something like three-fourths of their area. It was the first instance he had heard of this being done. They could not work economically with the large boxes; and, therefore, they decided to reduce the area. He was interested hearing the President's remarks as to the use of thick layers of lime, and was pleased he had worked them so satisfactorily. There was no doubt that a liquor-seal was not pure liquor; there must be a certain amount of tar with it. But when the tar was mixed with liquor, there was not so much resistance as with tar by itself. The gas had to force the seal in any case; and it would naturally go the shortest and easiest route. There was therefore no necessity for a great depth below the dip-pipes.

On the proposition of Mr. CARPENTER, seconded by Mr. BEST, a hearty vote of thanks was passed to Messrs. Guyatt and Clarke for their interesting contributions.

Mr. GUYATT, in responding, remarked that this was the first occasion he had had the honour of reading a paper before the Association; and he was pleased with its reception.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said his next duty was to propose that Mr. H. Wimhurst, the Vice-President, be elected President for the ensuing year. For a long time from the beginning, Mr. Wimhurst acted as Secretary; and he laboured hard to pull the Association together, and to get it into proper working order. He was sure he would make a thorough good President, and keep the work of the Association in the way it should go.

Mr. C. W. GRIMWOOD (Sudbury) seconded the resolution, and heartily endorsed the remarks of the President.

The motion having been cordially agreed to,

Mr. WIMHURST, in response, said he felt that the honour the members had conferred upon him was more than he deserved. He certainly had had the welfare of the Association at heart from the commencement; and, with the support of the officers and members, he would do his utmost to further its interests during the coming year.

Mr. J. CARTER (Lincoln) moved the appointment as Vice-President of Mr. J. G. Hawkins (Spalding), who, he remarked, was as respected as he was well known.

Mr. GUYATT seconded the motion, and it was agreed to.

Mr. Troughton, whose admirable performance of his duties as Hon. Secretary and Treasurer was recognized by all the members, was re-elected; and Mr. Charles Ellis and Mr. C. Panchen were re-appointed as Auditors.

Mr. R. Brown, Mr. T. A. Guyatt, and Mr. E. W. Smith were elected members of the Committee—the last-named gentleman taking the place of Mr. Hawkins on his elevation to the Vice-Presidency.

Place of Next Meeting.

Mr. Wimhurst invited the Association to visit Sleaford for their September meeting, which, he asked, might be held as early in the month as possible. His Chairman and Directors would give the members a very hearty welcome.

The invitation was cordially accepted.

Thanks to the Officers.

Mr. J. T. Jolliffe (Ipswich) asked the members to accord a hearty vote of thanks to the President and the officers for the work they had done for the Association during the past year. The members knew that Mr. Child would fill the chair well; and he had answered their expectations. His presidential address was really a masterpiece of composition; and it contained many original and happy thoughts. He was glad the members had come to this meeting in such good numbers, because he understood that the meeting at Romford was not so well attended as it should have been.

Mr. Carpenter seconded the motion, which was unanimously carried.

The President, in acknowledging the vote, said he joined the Association, as he had done one or two others of a similar character, with the intention of working in it; and the members rewarded him by placing him at the head of it. He thanked the members for the way they had supported him during his year of office. He would take the opportunity of saying that everyone who joined the Association ought not to be content with merely being a member, but should strenuously attempt to do work in some way in its interests.

A vote of thanks was also passed to the Mayor and Corporation for kindly permitting the use of the Guildhall for the meeting.

New Rules and Amendments.

The members next privately discussed, at considerable length, certain suggested alterations in, and extensions of, the rules, having for their object the admission of associate members. The first rule adopted (to be known as Rule 2 A) described the necessary qualifications for membership in the new class. It reads: "That associate members shall be either secretaries or auditors not exclusively engaged in gas companies' work, directors of gas undertakings, gas engineers, or such other gentlemen, who, by reason of their scientific or engineering knowledge, shall, in the opinion of the Committee, be likely to further the interests of the Association as set forth in Rule 3." Rule 13 A confers on associate members "all the benefits of the Association, except voting upon any question." The annual subscription is to be the same as for members—10s. 6d. per annum. The new rules rendered necessary some minor amendments in other rules.

This concluded the business proceedings.

The Inclined Retorts at the Cambridge Gas-Works.

Waiting outside the Guildhall were a number of brakes, which conveyed the members to the gas-works, where, by the kind permission of the Directors, they were afforded an opportunity of inspecting the installation of inclined retorts, which was erected by the New Conveyor Company. The retorts, which are 20 feet in length, are set six in a bed; and there are five beds. Splendid results are obtained, though a somewhat heavy charge—7½ cwt.—is used. The production of gas is 480,000 cubic feet per day; and the cost works out to 1s. 3d. per ton of coal carbonized from the coal-breaker out into the yard. It had been arranged that some of the retorts should be discharged on the arrival of the visitors; and, although they were about an hour behind the appointed time owing to the length of the proceedings at the meeting, they had the satisfaction of seeing that the delay had had no material effect on the free discharge of the retorts. The Engineer (Mr. R. Brown), with pardonable pride, directed attention to the excellent heats, and the evenness of the charges. Other parts of the works were also visited.

In the evening, the members and friends, together with a few local gentlemen, dined at "Ye Olde Castel Hotel."

The Inclined Retort Patent.—We understand that practically the whole of the opposition to the application of the Automatic Coal-Gas Retort Company for an extension of their inclined retort patent has now been withdrawn. When last we noticed the matter, the two principal remaining opponents were The Gaslight and Coke Company and the Gas Companies' Protection Association. The latter shortly afterwards retired; and the former, though apparently somewhat tardily, have seen their way to follow suit. The Company are about to erect a new installation of inclined retorts; and there is every likelihood that before long further extensions in this direction will be made by them. It may be admitted that, in view of the magnitude of the operations of the Company, they had something worth fighting and negotiating for; but, on the other hand, in the case of an invention of this kind, which Justice Romer aptly described as a "pioneer" one, and which has so far ill-rewarded its introducers, it would have been, to say the least, unbecoming on the part of a Company holding the position of The Gaslight and Coke Company to have jeopardized the application of the owners of the patent for a prolongation of the possession of their rights in it by carrying their opposition further, and putting in an appearance before the Privy-Council. It is expected that the hearing of the application will take place next month.

THE PRODUCTS OF COMBUSTION OF ILLUMINATING GAS.

The communication on this subject made by Professor Gréhant to the "Société d'Encouragement pour l'Industrie Nationale," and which has recently been published in the "Bulletin" of the Society, has already been briefly noticed in the "Journal" (see *ante* p. 722). Further particulars of this interesting paper may be learned from the following digest of its contents:—

Coal gas is not without its dangers, though it is now so freely used on all sides. There is the danger of explosion of mixtures of coal gas and air. A notion of the violence of the explosion of such a mixture may be gained by exploding a mixture of 10 c.c. of gas and 58·6 c.c. of air—such being the theoretical proportions for complete combustion—in a bell-glass immersed in water. Bearing in mind that a room 6¼ feet square will contain about 100,000 times this quantity of such a mixture, it will be realized that the explosion may be practically irresistible.

Coal gas may be readily prepared on a small scale by heating coal in an iron tube which is closed at one end, and provided at the other end with a pipe for carrying off the gas. Lebon produced gas from wood and coal in 1786 in a similar manner; and a statue in the great gallery of the Conservatoire depicts him in the act of observing the flame of the coal gas he had prepared. The author exhibited photographs of this statue, and of the plant now employed for the industrial production of gas.

The powerful odour of coal gas favours the detection of leaks. A sample of purified coal gas, according to an analysis by Professor Schutzenberger, has the composition shown below, and the volumes of oxygen required for the combustion of the several components and the volumes of carbonic acid formed are also given:—

Component Gases.	Volumes per Cent.	Volumes of Oxygen Consumed.	Volumes of Carbonic Acid Formed.
Hydrogen	45·6	22·8	..
Carbonic oxide . . .	6·6	3·3	6·6
Carbonic acid . . .	3·6	..	3·6
Methane	34·9	69·8	34·9
Ethylene	4·1	12·3	8·2
Butylene	2·3	13·8	9·2
	..	122·0	62·5

Thus 122 volumes of oxygen are needed to consume 100 volumes of coal gas; and about half that volume of carbonic acid is produced. Evidently therefore it is injurious to breathe the air, poor in oxygen and rich in carbonic acid, which is found above and about gas burners; and such contaminated air should be avoided. Whether the various types of burners produce carbonic oxide also is a more vexed question, which is about to be considered.

In the researches undertaken by the author, the following methods of estimating carbonic acid, oxygen, and carbonic oxide were used.

Carbonic acid was estimated by bubbling the gas slowly through a long, slightly inclined tube charged with filtered baryta water. The rate of passage of the gas was controlled, and the volume of the gas was ascertained, by means of an aspirating bottle. The barium carbonate formed was subsequently decomposed in a vacuum by means of boiled dilute hydrochloric acid; and the volume of carbonic acid was measured. For example, suppose 1500 volumes of gas were passed through the baryta water and yielded 12 volumes of carbonic acid; this amount of carbonic acid would be equivalent to 80 volumes in 10,000 volumes of the gas, or the gas would have contained 26·6 times as much carbonic acid as pure air contains.

Oxygen was estimated by exploding the gas or air containing it with hydrogen by means of a platinum wire rendered incandescent by the electric current. For example, suppose there were taken—

30·3 volumes of air vitiated by the combustion of gas.
46·9 ,, of vitiated air + hydrogen.
33·2 ,, remaining after the explosion
then 13·7 ,, equal the contraction on explosion
and $\frac{13\cdot7}{3}$,, represent the oxygen present.

Hence 30·3 volumes of vitiated air contained $\frac{13\cdot7}{3} = 4\cdot566$ volumes of oxygen, or the air contained 11·07 per cent. of oxygen.

Carbonic oxide was estimated by a physiological method depending on the change which is effected by carbonic oxide on the blood of an animal which is caused to breathe for one hour air suspected of containing carbonic oxide. The method was devised for the estimation of after-damp in mines; and is described in a paper in the "Comptes Rendus" for Nov. 8, 1897. It is applicable to air containing 1-500th to 1-60,000th of its volume of carbonic oxide. If air contains more than 1-100th of its volume of carbonic oxide, the animal dies in less than an hour.

A very sensitive method, devised by Nicloux, for the detection of small quantities of carbonic oxide in air, was also employed in order to avoid the wanton destruction of animals. It depends on the oxidation of carbonic oxide by anhydrous iodic acid. This reaction was first of all observed by Ditte; and was used by both Harpe and Reverdin for detecting carbonic oxide in air.

Nicloux's method is as follows: The gas or air under examination is drawn, by means of an aspirator, through a train of apparatus, consisting of the following pieces in the order in which they are named. Three U-tubes, the first containing pellets of caustic potash for the absorption of carbonic acid, the second sulphuric pumice as a desiccating agent, and the third 30 to 40 grammes of anhydrous iodic acid; a Wills' potash bulb containing 5 c.c. of solution of caustic potash, specific gravity 1·2, diluted with 5 c.c. of water, which solution fixes the iodine which is liberated from the iodic acid by carbonic oxide. The U-tube containing the odic acid is immersed in an oil bath heated to 150° C. As soon as the necessary volume of gas has traversed the apparatus, the solution of potash is washed into a 100 c.c. measure, and its volume made up to 40 c.c.; then there are added to it some sulphuric acid, 5 c.c. of carbon bisulphide, and a few centigrammes of sodium nitrite. The whole is then agitated. The carbon bisulphide dissolves the iodine liberated from the iodic acid by the carbonic oxide, and acquires a red tint. A comparative test is made by adding from a burette a solution containing 0·0001 gramme of potassium iodide per c.c. to another measureful, until an equally deep tint is attained. The volume of carbonic oxide, expressed in cubic centimetres at 0° C. and 760 mm., is found by dividing by 3 the number of milligrammes of potassium iodide used. This method is very convenient. But as acetylene, ethylene, and petroleum vapours also reduce iodic acid, the quantitative results should, as a rule, be checked by the physiological method.

Using these methods of estimation, the products of combustion of various types of gas-burners were examined.

Flat-Flame (Butterfly or Batswing) Burner.—Three of these burners were placed at equal distances apart on a ring, through which gas, measured by a meter, was supplied to them. Around the burners was placed a cylinder of galvanized iron, 26 inches high and 16½ inches wide, provided with a hinged door 8¼ inches wide and 4¾ inches high. To the top of the cylinder was soldered a pipe 20 inches high, which communicated, by means of a copper pipe bent at right angles, with a gasholder in which was a dog weighing 13¼ lbs., the blood of which had been examined and found to be normal. The dog was allowed to breathe the products of combustion, and the air which was carried along with them into the gasholder, for one hour. Its blood was then again examined, and gave a rather greater reduction, indicating that the mixture which the dog breathed contained 1-60,000th part of carbonic oxide. This trial proved that the three flat-flame burners, which together consumed 15·68 cubic feet in the hour, yielded only a very trifling and negligible quantity of carbonic oxide.

Staircase Lighting and Ventilation.—The temperature at the upper floors of staircases lighted by gas is high; and the air is vitiated. In one case, 3 hours after the gas was lighted, the air at the fifth (top) floor contained $\frac{19{\cdot}5}{10{,}000}$ of carbonic acid, which is about six times the amount in pure air, and 20·5 per cent. of oxygen in place of 20·8. The air on staircases therefore appears not to be renewed sufficiently often. A remedy would be found by providing holes in the ceiling at the top of the staircase, or a pipe, for the exit of the hot air; but care should be taken that the draught so created should not be excessive.

Argand Burner.—An argand burner consuming 5·4 cubic feet per hour was lighted. It produced 3·38 cubic feet of carbonic acid per hour. About an inch above the level of the top of the chimney was placed a sheet-iron cylinder, 2 inches high and 4¾ inches wide. This terminated above in a pipe, 34½ inches high, from which a sample of the mixture of the products of combustion and the air drawn in by them was aspirated through baryta water. 1350 c.c. of this mixture produced a precipitate which yielded on decomposition 4·9 c.c. of carbonic acid, or the mixture contained 0·36 volume per cent. of carbonic acid. The mixture was found to contain 20·07 per cent. of oxygen; and therefore 0·73 per cent., or double the amount of carbonic acid found, had been used up in the combustion of the gas. A simple calculation gave the amount of air drawn up the tube by the burner. It was 28,900 litres per hour, showing that about 1000 cubic feet of air were drawn into the pipe placed over the lighted argand burner.

Heating Burners.—A similar experiment to that made with the argand burner was carried out with an atmospheric burner, consuming 21½ cubic feet per hour, and forming 13·4 cubic feet of carbonic acid per hour. Such burners are commonly used in laboratories and kitchens. Around this burner was placed a cylinder of galvanized iron, 26½ inches high and 16½ inches wide, terminating above in a pipe 20 inches high and 2½ inches wide. Five minutes after the burner was lighted the temperature of the air in the pipe was found to be 446° Fahr.; ten minutes afterwards it was 509° Fahr. The mixture of air and products of combustion which passed up the pipe was found to contain 2·24 per cent. of carbonic acid, and only 18 per cent of oxygen (in place of 20·8 per cent. in pure air). The volume of air which passed through the pipe in an hour was calculated, and found to be 600 cubic feet. On applying a lighted taper to the door of the cylinder, it was found that the draught was sluggish; and that a portion of the products of combustion passed out at the lower part of the cylinder. A pipe, having a total height of 88 inches, was then used in place of the shorter pipe, and a good draught was thus secured. The temperature at the top of the pipe was then found finally to be 400° Fahr. The mixture aspirated from the pipe contained 1·458 volumes per cent. of carbonic acid; and calculation proved therefrom that 940 cubic feet of air were drawn up the pipe in one hour. These figures showed that makers of heating appliances should be careful to place them in positions where the draught is sufficiently great to secure the elimination of the products of combustion and the air drawn up with them. They should avail themselves of the heat of the products in order to secure proper ventilation of an apartment.

The Production of Carbonic Oxide by the Combustion of Gas.—When the flame of a bunsen burner is allowed to strike back, and the gas to burn at the base of the burner, acetylene and carbonic oxide are found in the products of combustion. On placing a funnel above the burner and compelling an animal to breathe the products and air collected therefrom, it died from oxycarbonated blood. In order to ascertain that its death did not result from the escape unconsumed of carbonic oxide present in the coal gas, the latter was passed through a solution of cuprous chloride in hydrochloric acid, which solution absorbed the greater part of the carbonic oxide in the gas. On burning the gas thus treated in a bunsen of which the flame was allowed to strike back, the effect on an animal was precisely the same as when untreated coal gas was thus burnt. A sample of methane or marsh gas was prepared by heating acetate of soda with twice its weight of soda-lime. This methane, when burnt in the same manner in a bunsen, yielded products which smelt strongly of acetylene. The blood of an animal which breathed the mixture of these products and the air drawn up by them for half an hour was shown to contain gas with 16·6 per cent. of carbonic oxide. Therefore, even marsh gas, when incompletely burnt, was proved to yield carbonic oxide; and a laboratory illustration of the phenomenon of the production of after-damp by explosions in mines was thus furnished. In mines, however, the dust which permeates the air, in the event of an explosion, increases the production of carbonic oxide, as Professor Chesneau and Dr. Haldane have proved. The author's researches indicate that whenever flame is obstructed, whether by the bottom of a vessel, the sides of an enveloping tube, or, as in the case of mine explosions, by the uneven walls of coal, carbonic oxide is formed.

The Welsbach Burner—The author repeated with care experiments he had formerly made, which went to prove that carbonic oxide was present in the products of combustion from the Welsbach burner; and he confirmed his earlier results. In a sample of gas collected from a point about an inch above the mantle, carbonic oxide was proved to be present by the physiological test. Of many researches, the following one may be instanced as typical. In a room about 12 feet square and 12 feet high, three burners were lighted at nine in the morning, and at four in the afternoon the air of the room was examined for carbonic oxide, and found to contain 1-30,000th of its volume of that gas. This quantity was far too small to be in any way dangerous to health; but the fact that carbonic oxide was present at all indicates that special attention should be paid to the adequate ventilation of rooms lighted by incandescent burners. It seems possible that the carbonic oxide results from the dissociation of carbonic acid at the high temperature of the mantle.

In order to carry off the products of combustion from heating burners in laboratories and kitchens, the author has devised a cupboard with a sliding glass front, resembling the draught cupboard of a laboratory, in which to inclose the burners during use. The noxious products may thus be conveyed directly from the burners to the exterior of the room. The author recommends also that gas should be turned off at the meter when a household retires for the night, as the escape of carbonic oxide from leaky fittings, &c., into the sleeping apartments would thus be prevented.

THE DIRECT ESTIMATION OF NITROGEN IN GASES.

At a recent Meeting of the Liverpool Section of the Society of Chemical Industry, Mr. J. Kent Smith read a paper in which he described a method for the direct estimation of nitrogen in illuminating and other gases without the aid of gas analysis apparatus. The following is the text of the paper as given in the current number of the Society's "Journal":—

The method in vogue for determining nitrogen is to make a complete analysis of the gas, on any quantity from 30 to 100 c.c. When an idea of the general composition of the gas is wanted, this method cannot be beaten, providing a good description of apparatus is used, and the analysis made over mercury. But if the percentage of nitrogen only is required, this method has the following objections: (*a*) The constituent to be estimated—often present in almost the smallest proportion of all the constituents—is obtained by "difference;" the burden of all the other errors falling upon it. (*b*) The analysis requires the unceasing attention of a moderately skilled operator for at least an hour. (*c*) A comparatively small sample, taken at one moment generally, is examined.

My method, once set going, requires no supervision—the analyst or manager being able to go on with his other work; while a large sample, taken over the whole period during which the test is made, is worked upon. The method is a "continuous" one, founded on the well-known nitrogen method of Dumas; the after-manipulation being precisely similar to that made use of with the Bunte burette.

The mode of procedure is as follows: The gas passes first through an experimental gas-meter into an expansion-bottle, the cork of which has four holes fitted respectively with an inlet-tube, an outlet-tube, a thermometer, and a tube attached to a home-made gauge. It then passes, if the gas be under considerable pressure, through a Dreschel or similar bottle containing a layer of sulphuric acid, and provided with a check clip, and can thus be regulated. In the case of ordinary "town gas pressure" only being available, it is advisable to do without this bottle. The gas next passes through a porcelain or glass combustion-tube, packed at either end with ignited asbestos fibre, and containing copper oxide and metallic copper, heated red hot by means of a combustion furnace. The escaping gases are led through an ordinary pneumatic trough into a receiver consisting of a bottle, the capacity of which has been exactly determined, and the neck of which can be fitted with a one-hole rubber stopper carrying a capillary glass tap. When ordinary coal gas is passed slowly through heated copper oxide, it is completely oxidized to carbonic acid, sulphurous acid, and water; the nitrogen remaining unchanged. The water condenses, and the carbonic acid and nitrogen are collected together in the receiving-bottle.

To perform a test, the porcelain or glass tube is first heated to bright redness (a little gas having previously been passed through, thus preventing an explosion); and when red-hot, the gas to be examined is slowly turned on. The rate, as afterwards described, will depend on local conditions. The measured bottle is slipped over the bubbles issuing from the beehive shelf, and the meter simultaneously read. When enough gas has been passed, this bottle is slipped away, and the meter again read. The bung, with the tap closed, is inserted into the bottle neck under water, and the bottle transferred, mouth down, to an ordinary retort-stand. Suction is applied with an ordinary suction-bottle at the tap, which is gradually opened, and the enclosed water sucked out. Strong solution of caustic soda is then sucked in, and the bottle well shaken. On removing the bung below water in an open vessel—*e.g.*, a bucket—the water rises in the bottle. The bottle is plunged overhead for a minute to bring it to the same temperature as the water, and slowly raised until the water-level inside and outside coincides. The stopper is inserted, and the bottle removed and wiped. The water contained in it is then measured; and the difference between this measurement and the total capacity of the bottle is equal to the nitrogen contained in it. By observing the temperature of the in-going gas and of the water in the bucket, also the barometer in the room, the results can be accurately corrected if necessary. It is evident that the more delicate the meter indication, the more accurate the test, or the less gas necessary to be used.

As the oxidation of the gas is proportionate to its period of contact with the hot copper oxide, the longer the column of this substance the quicker may the gas be passed. With a delicate meter and a fairly long combustion-tube, results of great rapidity should be obtained. The copper oxide in the tube becomes reduced in time to copper. It may be revivified by heating the tube to redness, with a continuous current of air flowing through it, after "drawing" the copper spiral.

The application of this method is strictly limited. Where only a very occasional determination is to be made, or only a small sample of gas is obtainable, or the gas has been brought from a long distance, no one would dream of using the method. But where it is necessary to get a series of nitrogen determinations in a gas supply with as little supervision as possible, the method should be found to possess considerable practical value. The tube furnace would be lighted early, and a suitable bye-pass provided, so that when an experiment was finished the tube could be kept warm, but not at full heat, till the next test, when an exposure of a few minutes would suffice to bring it up to bright redness.

I would strongly advise that a tube nearly filled with copper oxide should be heated for some little time in a current of air before inserting the copper spiral. If there be no hurry for the test, a larger collecting-bottle might be used and more gas passed; the result being so much more accurate.

The results by this method agree well with those obtained by the ordinary practice; and analysis has shown that, if the combustion is properly conducted, the residual gas consists solely of nitrogen.

Gray has shown the complete reducing action of metallic copper on nitric oxide. If, however, the presence of this oxide be feared, after evacuating the measuring-bottle a little strong ferrous sulphate solution is sucked in, and the whole shaken. Any nitric oxide would be absorbed; and thus the result would be as much too low as it would have been too high. Nitric oxide, however, makes its presence apparent by darkening the ferrous sulphate solution. If the tube be properly packed, and hot enough, and the gas be not passed too quickly, it will be entirely absent. Strong caustic soda is then sucked in, and the operation finished as usual.

Correction.—In the report of the Informal Meeting of Scottish Gas Managers at Glasgow, in the "JOURNAL" for the 11th inst., the remarks represented as having been made by Mr. R. B. Main, of Glasgow, were really made by Mr. A. P. Main, of Glasgow. Our reporter was misled by the similarity of appearance of the two brothers.

THE WATER SUPPLY OF LONDON.

At the Meeting of the Society of Arts last Wednesday, an interesting paper on this subject was read by Mr. WALTER HUNTER, M.Inst.C.E., Engineering Director of the Grand Junction Water-Works Company, and Joint Engineer with Mr. R. E. Middleton, M.Inst.C.E., to the Staines Reservoirs Committee.

The author commenced by giving a sketch of the history of the water supply of London; quoting from the recently published work on this subject by Dr. Sisley. Coming down to 1606, he showed that in that year the Corporation obtained an Act to convey water from Hertfordshire to the City, and a supplemental Act in the following year; but they failed to avail themselves of their provisions. The works contemplated under these Acts were undertaken in 1609 by Hugh Myddelton, who, when his funds became exhausted in 1612, received the necessary money from King James I., on condition that he should share in the profits. This was the commencement of the prosperous enterprise since known as the New River Company. The Chelsea Company was founded in 1721, the Vauxhall Company in 1805, the West Middlesex and East London Companies in 1806, the Kent in 1810, the Grand Junction in 1811, and the Southwark in 1822. The history of these Companies reveals the fact that the municipal and local authorities were unwilling to undertake the risk of supplying London with water, leaving it to be carried out by private enterprise, which in this way, as in so many other ways, has proved itself to be the great factor in promoting the material interests of the country.

Having traced the history of the London Water Supply, the author turned to the consideration of its extent at the present day; dividing his subject under six headings: (1) The area and population to be served. (2) The quantity of water supplied. (3) The sources of supply and the amount taken from each source. (4) The works for the storage, filtration, and distribution of the water by the Companies for the supply of their several districts. (5) The quality of the water. (6) The supply in the future.

The area supplied by the eight Metropolitan Water Companies under their parliamentary powers is generally known under the name of Water London, and has a total area of 620 square miles. It extends from Amwell (near Hertford) in the north to Croydon in the south, and from Hampton in the west to Ilford in the east. Its population in 1891 was about 5,500,000, and is now estimated at about 5,800,000; having increased from 958,863 at the beginning of the century. Water London contains within it the Administrative County of London, and is co-extensive with the area called Registration London by the General Register Office, with the addition of the hamlet of Penge. Greater London is the area included within the Metropolitan and City Police districts. It comprises all parishes wholly situate within a circle of 15 miles radius from Charing Cross, and all of which any part is included within a circle of 12 miles radius from the same centre. Its total area is 701 square miles, and its population in 1891 was 5,633,332. It is this area and population, with the addition of that of Water London which lies outside it, which Lord Balfour's Commission took into consideration when framing their valuable and exhaustive report in 1892-3. In addition to the eight Metropolitan Water Companies, the following ten Companies and Local Authorities furnish supplies: The Barnet District Gas and Water Company, the Central Middlesex Water Company (Alperton and Sudbury), the Colne Valley, and East Surrey Companies, the Epsom Council, the Rickmansworth, the South-West Suburban, and the Sutton Water Companies, the Uxbridge Council, and the West Surrey Water Company. As the quantity of water supplied by these smaller bodies was estimated by Lord Balfour's Commission to be not more than 10 million gallons daily, the author left them out of account, and confined his attention to the eight Metropolitan Companies. The average daily supply by them in 1897 amounted to 202,102,544 gallons to a population of 5,703,404; being an average of 35·43 gallons per head. The sources of supply are: (a) The Thames and the gravel beds adjacent to the river; (b) the Lea and springs in the Lea Valley; and (c) 32 wells in the chalk formation. In 1897, the above-named bulk of water was drawn from the sources in the following quantities; the percentages of the whole supply being given in parentheses: Thames, 112,178,641 gallons (55·51); Lea, 55,292,863 gallons (27·36); springs and wells, 34,488,016 gallons (17·06); Hampstead and Highgate ponds, for non-domestic purposes, 143,024 gallons (0·07).

The recital of the foregoing facts and statistics brought Mr. Hunter to the fourth division of his subject—viz., the works established by the Companies for the supply of their districts. Beginning with the New River Company—whose district comprises the City of London (with a few exceptions in Bishopsgate and Aldgate, supplied by the East London Company), Edmonton, Enfield, Hornsey, Tottenham, and, in Hertfordshire, Broxbourne, Cheshunt, Great and Little Amwell, Hoddesdon, St. Margaret's, Ware, Wormley, and St. John's without the Borough of Hertford—he showed that the population supplied in 1897 was 1,176,363; the average daily supply being 35,974,488 gallons. The Company derive their principal supply from the Lea, from which they have a preferential right to take 22½ million gallons daily. The New River is about 26 miles long, and commences at the Chadwell springs, between which and Hornsey are a number of wells, with pumping machinery. The Company have

also deep wells at Hampstead Heath, Hampstead Road, and Bush Hill Park, Edmonton; but they have no pumping machinery. In addition to the above sources of supply, the Company will have the right to take 11¾ million gallons daily from the Thames when the Staines reservoirs works are completed. The Company's reservoir capacity is 35½ million gallons; while the Hampstead and Highgate ponds hold 29 million gallons of water suitable for non-domestic services.

The East London Company supply 30 parishes and places in the county of Middlesex, and 18 in the county of Essex. The water is derived from four separate sources: (1) From the River Lea, the intakes being at Enfield Lock and Ponders End. (2) From deep wells in the chalk at Walthamstow, Chingford, Lea Bridge, and Waltham Abbey; and three additional wells are being sunk at Romney Marsh, Ponders End, and Barking. (3) From the Thames at Sunbury. (4) From springs at Hanworth. The Company's works are ten in number, situate at Lea Bridge, Walthamstow, Chingford Hill, Woodford, Buckhurst Hill, Hornsey Wood, Sunbury, Hanworth, Waltham Abbey, and High Beach. The water flows from the reservoirs at Walthamstow in an open channel 1¼ miles long to the filter-beds, of which there are 25, with a total area of 24 acres. The filtered water is pumped into the district by ten engines and four turbines, with an aggregate horse power of 2710. There is a deep well in the chalk whence water is pumped by an engine of 250-horse power. The chief offices of the engineering department, stores, testing, and workshops, are at the Lea Bridge station. At the Walthamstow station there are ten storage reservoirs, with a total capacity of 1215 million gallons. The Company now send out more water than any of the other London Companies; their average daily supply being in 1897, 41,036,906 gallons, distributed to a population of 1,261,732.

The West Middlesex Company was incorporated in 1806 by Act of Parliament, which empowered them to supply with water the parishes of St. Paul's, Hammersmith; All Saints', Fulham; St. Mary Abbott's, Kensington; St. Nicholas', Chiswick, with other parishes in the county of Middlesex, and also certain parishes in the county of Surrey, to which, however, the Company did not give any supply. By a further Act of 1810, the limits were enlarged; and by another Act of 1866, the district was extended to the parishes of St. John's, Hampstead, and to Hendon, Willesden, and a small portion of Acton, all in Middlesex. The intake of the Company from the Thames is at Hampton, where there are a pair of engines of 900-horse power, capable of delivering 32 million gallons per day, and one engine of 400-horse power, equal to delivering 24 million gallons per day into the subsiding reservoirs at Barnes, a distance of nine miles, through two 36-inch cast-iron mains. At Barnes there are seven subsiding reservoirs, with a total available capacity of 397 million gallons, four of which have been recently constructed, and eleven filter-beds, having an area of four acres. The water is filtered through a stratum of washed sand 2 ft. 9 in. thick, superposed upon a stratum of various sized stones, 1 foot in thickness. At Hammersmith, the station on the Middlesex side of the Thames, the water is pumped for the supply of the whole district. The water gravitates from Barnes to the engine wells through a channel 8 feet in diameter, which has recently been made under the bed of the river. The engine power available is 1605-horse power, capable of pumping 30 million gallons daily. Nearly the whole of the district is supplied by direct pumping, by means of three 30-inch and two 21-inch mains, with one 14-inch and one 10-inch main. The capacity of the service reservoirs is 19,422,000 gallons. The length of pumping and other mains, including the service mains, was 492½ miles on Dec. 31, 1898. The total quantity of water that may be drawn from the Thames, by agreement with the Thames Conservancy, is 24½ million gallons per day, to which will be added a further supply of 11¾ million gallons daily when the Staines reservoirs works are completed. The average daily supply in 1897 was 20,337,019 gallons, distributed to a population of 601,509.

The Grand Junction Water-Works Company was incorporated by Act of Parliament in 1811, which transferred to the Company parliamentary powers for supplying certain western districts of the Metropolis, under the Act granted to the Grand Junction Canal Company in 1798. The original works were situated at Paddington, and the water was taken from the canal till 1826, when the source of supply was removed to the Thames at Chelsea. In 1835, the intake was removed to the works at Kew Bridge. In 1852, the intake was removed to its present position at Hampton. The area of supply includes the parishes of Paddington, Kensington, Marylebone, St. George's, Hanover Square, St. James', Westminster, Hammersmith, Brentford, Ealing, Chiswick, Acton, Hanwell, Isleworth, Twickenham, Teddington, Hampton, Hampton Wick, Hampton Court, Bushey Park, Whitton, Hanworth, and Heston, all in the county of Middlesex. The works are situated in the Hampton and Sunbury parishes, Middlesex, upon the north side of the Thames, at Kew Bridge, at Campden Hill, and at Ealing. The works at Hampton consist of a storage and subsidence reservoir, having a capacity of 45 million gallons; the total area of filters being 15¾ acres. The filtering material consists of washed sand, 3 feet in thickness, resting upon gravel and stones 2 feet thick, gradually increasing in size towards the bottom of the filter. The country district is supplied from the Hampton works by a pair of compound beam engines and a Davy engine, to which a vertical triple-expansion engine is now being added. The water is pumped through one 30-inch and one 12-inch main running through New Hampton into the Twickenham Road, along which the 30-inch main proceeds past the Kew works, with which it has two connections. The water is pumped from Hampton to Kew through two 33-inch mains. The Kew works consist of one upper reservoir, of 8½ million gallons capacity; one lower reservoir, of 5 million gallons capacity; eight filter-beds, 8¾ acres in extent; and one filtered water reservoir (covered), of 2½ million gallons capacity. From these works, the town district is supplied by two 30-inch mains. There are eight pumping-engines, having a capacity of about 26 million gallons in 24 hours. At Ealing, the Company possess a service reservoir for filtered water, having a capacity of 3 million gallons, and a large storage reservoir containing 50 million gallons. At the Campden Hill works there are three filtered water storage reservoirs, and three pumping-engines capable of raising about 20 million gallons daily into a stand-pipe to a level of 270 feet above Ordnance datum. The Company have statutory powers to take from the Thames any water that is required for the purpose of their district. Under the agreement of 1852 and 1886 with the Thames Conservancy, these powers are at present exercised to an extent not exceeding 24½ million gallons daily. When the Staines reservoirs works are completed, the Company will have an additional daily supply of 11¾ million gallons. The average quantity of water sent out per day in 1897 was 19,532,580 gallons, distributed to a population of 398,390.

The intake of the Chelsea Water Company is situated at West Molesey, on the south bank of the Thames; the river being the only source of supply. The works consist of the intake and pumping plant equal to lifting 35 million gallons from the river into reservoirs, whence it is delivered to the Surbiton works by gravitation. There are four subsiding reservoirs, having a total capacity of 140 million gallons. These reservoirs are now being enlarged so as to contain 189 million gallons. The water is delivered from Molesey to Surbiton through two 36-inch mains. The works at Surbiton contain 8 acres of filtering area and pumping power equal to 24 million gallons in 24 hours. From Surbiton the filtered water is pumped to Putney Heath through three mains—one 30-inch for the whole distance, one 30-inch reduced to 24-inch on the top of Kingston Hill, and one 15-inch. The storage capacity of the filtered water reservoir at Putney Heath is 11 million gallons; but it is being doubled by works now under construction. From the service reservoirs on Putney Heath there are five trunk lines of mains, of which three 30-inch and two 15-inch cross Putney Heath, and enter the main road at the top of Putney Hill. At this point they are reduced in diameter to 24-inch and 12-inch respectively, and, passing down Putney Hill, cross the South-Western Railway by an aqueduct bridge, and the Thames beneath the footways of Putney Bridge. From the north end of Putney Bridge three 24-inch, one 18-inch, and two 12-inch mains distribute the water over the district of the Company, which is situated wholly within the Metropolis, and has an area of five square miles. The number of supplies at Michaelmas, 1898, was estimated at 37,879; and the population served at 292,000 approximately, as compared with 276,691 in 1897. The average daily quantity of water sent out in the year ending Dec. 31, 1898, was 12,079,000 gallons, as against 12,283,789 gallons in 1897. The Company have power to abstract 22 million gallons of water daily from the Thames, which gives a large surplus beyond that required for the present supply of the district. It is estimated that the eventual maximum daily supply when the Company's district is entirely built over will not exceed 17½ million gallons.

The area of supply of the Lambeth Company consists of the parishes of Thames Ditton, Esher, Long Ditton, Kingston, Putney, Malden, Morden, Wimbledon, Merton, Mitcham, Tooting Graveney, Clapham, Wandsworth, Battersea, Streatham, Croydon, Newington Butts, Newington, Bermondsey, Camberwell, Lambeth, Horselydown, St. Saviour's, St. George-the-Martyr, Christ Church, St. Olave, St. Thomas, the Clink Liberty, in Southwark, and such parts of Beckenham and Lewisham as lie on the western side of the River Ravensbourne. The principal intake of the Company from the Thames is at West Molesey, where there are a pair of pumping-engines of 100-horse power and another pair working two centrifugal pumps, the total engine power being capable of pumping 42½ million gallons per day. The present storage capacity of the reservoirs is 125 million gallons, which is now being increased to 465½ million gallons. The Company have powers to take 24½ million gallons daily from the Thames; while an additional quantity of spring water can be obtained from under the land at the Molesey works to the extent of from 6 to 8 million gallons per day. From the reservoirs the water flows by gravitation, a distance of 3½ miles to the filtration works and main pumping-station at Ditton, through two means of communication—a brick conduit of oval shape 5 ft. 9 in. high and 4 ft. 9 in. wide, with intervals of cast-iron pipes 54 inches in diameter; and an iron pipe 36 inches in diameter. There is also an intake at Ditton; but this is only used when from special causes the intake at Molesey is not available. At Ditton, about one-third of the unfiltered water is delivered on to four low-level filter-beds, and the remainder into a suction reservoir at the same level. Three engines, of a total capacity of 280-horse power, lift the water from this reservoir into one serving eight filter-beds 16 feet higher than those referred to. The two reservoirs contain together 3 million gallons. There are in all twelve filter-beds containing a filtering area in the

aggregate of 12½ acres. The filtering material is composed of 3 feet of washed sand and 3½ feet of fine and coarse gravel. From Ditton the bulk of the water is pumped through three 30-inch mains a distance of 10 miles into two reservoirs at Brixton; the remainder being delivered into a reservoir at Coombe through two 12-inch mains which also serve as distributing mains. The reservoir at Coombe supplies by gravitation the districts of Esher and East and West Molesey through two 10-inch mains. The total engine power available at Ditton is 150-horse power for the Coombe reservoir, 1660-horse power for the reservoirs at Brixton, and 330-horse power for Coombe and Brixton alternatively. These engines are capable of pumping approximately 3, 39, and 7 million gallons per day respectively. From the Brixton works, water is supplied by gravitation into the town district, the whole of which is on constant service, through four trunk mains, respectively 24, 20, 18, and 12 inches in diameter; while the water for the country district is pumped from the station by ten engines of 1005-horse power into service reservoirs, through nine trunk mains, which also serve for distribution. The water is sent from these reservoirs through fifteen leading mains, varying from 10 to 18 inches in diameter. The service reservoirs for the supply of the country district have a total capacity of 28,765,000 gallons. The average quantity of water supplied daily in 1897 was 23,688,305 gallons, to a population of 666,981.

The Vauxhall Company was founded in 1805, and the Southwark Company in 1822; the two Companies being amalgamated under the name of the Southwark and Vauxhall Company in 1846. The supply was originally obtained from the Thames at Battersea; but under the Act of 1852, the intake was removed to Hampton. Under their statutory powers, there is no limit to the quantity of water which the Company may take from the Thames; but the amount is restricted by agreement with the Thames Conservancy to a quantity of 24½ million gallons through their intake at Hampton. In 1897, however, the Company obtained temporary powers to take an additional quantity of 20½ million gallons daily from the Thames. These were made permanent by an Act of 1898, conditionally upon the Company constructing the storage reservoirs proposed under that Act, and with the restriction that the water might only be taken from the surplus above 285 million gallons flowing at Penton Hook Weir. When these works are completed, the Company will have powers to take 45 million gallons daily permanently from the Thames. In addition to the foregoing sources of supply, the Company obtained parliamentary sanction in 1884 to purchase lands, sink wells, and construct the necessary works to supply water therefrom. The first well was sunk at Streatham, and from it a quantity between 2 and 2½ million gallons daily has been regularly obtained since July 1, 1895. At Merton, the work of sinking another well is in progress; while further wells are under contemplation. The district supplied by the Company comprises part of Southwark, portions of Lambeth and Peckham, and the whole of Battersea; it also includes Ham, Petersham, Kew, East Sheen, Sheen, Roehampton, Mortlake, Barnes, Putney, and such parts of the parish of Wimbledon as are above the 100-feet Ordnance contour. The Company also supply Richmond to a considerable extent with water in bulk, under the agreement incorporated with the Company's Act of 1897. The present works of the Company are at Hampton, Battersea, Nunhead, Wandsworth, Forest Hill, Streatham, Raynes Park (site of proposed works), and Honor Oak. At Hampton there are three storage reservoirs, with a total capacity of 390 million gallons. The Company also possess at this station natural filtration works in the gravel, with an area of 39¾ acres. The number of filters in use is nine, having an area of 9¼ acres. An additional area of about 7 acres will probably be completed during the present year. The filtering material consists of 3 feet of sand, 1 foot of hoggin, 9 inches of fine gravel, and 9 inches of coarse gravel. Engines of 26 million gallons daily capacity pump the water to Nunhead or into the district; engines in duplicate of 16 million gallons capacity lift the water obtained from the natural filtration works; two pairs of single-acting quadruple expansion high-speed engines, driving centrifugal pumps with 20 million gallons daily capacity, raise water from the river to fill the reservoirs; and three inverted direct-acting Cornish engines of the "Bull" type, with 23 million gallons daily capacity, pump the unfiltered water to the Battersea works. Three sets of triple-expansion rotative pumping engines, with direct-acting pumps, are now in course of erection. The unfiltered water delivered by the 36-inch main from the intake of the works at Hampton is received at Battersea into three reservoirs, having a total capacity of 46 million gallons. It then passes through the filters, of which there are 11¼ acres, and is distributed by six Cornish engines, having a total capacity of 31½ million gallons daily. The works at Nunhead consist of four reservoirs, each having a capacity of 6 million gallons, and two having each a capacity of 3 million gallons. These reservoirs supply by gravitation a portion of the eastern part of the district, and also part of the Peckham and Dulwich districts. The engines are single acting, of the Cornish type, of 7 million gallons capacity per day. A preliminary boring has been sunk at these works, which struck the chalk at a depth of 167 feet. The works at Wandsworth contain two pairs of direct-acting quadruple expansion rotative engines capable of pumping 9 million gallons daily to the high-level districts and reservoirs at Forest Hill. These engines draw their supply from the 30-inch main from Hampton. At Forest Hill there are two reservoirs, each having a capacity of 500,000 gallons. The works at Streatham consist of two pairs of three cylinder triple-expansion engines with lift and pressure pumps delivering about 2½ million gallons daily against a head of 200 feet. The average daily supply of the Company in 1897 was 32,743,058 gallons; the estimated average population being 816,894.

The Kent Company was incorporated by Special Act in 1809, and extended under subsequent Acts of 1811, 1852, 1864, 1877, and 1888. They now supply water within an area of 178 square miles, comprising many rural districts in Kent. The population served was estimated at the end of 1897 to be 519,340; the number of supplies being 86,390. The average daily quantity supplied in that year was 15,482,053 gallons, or at the rate of 29 gallons per head of the population. About 93½ per cent. of the supplies are on the constant service. The water is, with one exception, obtained entirely from the chalk strata by means of deep wells and borings, fourteen in number. There are eight pumping-stations, situated on the sites of the wells. At Deptford there are six pumping-engines, with a total capacity of 25,170,000 gallons in 24 hours, supplying reservoirs at Deptford, New Cross, Greenwich Park, and Woolwich Common. At Plumstead, a rotative pumping-engine equal to lifting 1,296,000 gallons in 24 hours supplies reservoirs at Plumstead Common. At Shortlands there are two Cornish engines, with a total capacity of 2,750,000 gallons daily, supplying Chislehurst. At Crayford, three pumping-engines, with a total capacity of 4,500,000 gallons, supply Woolwich Common and Eltham. At Dover road, a pair of horizontal rotative engines will pump 364,000 gallons in 24 hours for the extra lift to Shooter's Hill. At Farnborough, there are four pumping-engines, with a total capacity of about 5,128,000 gallons in 24 hours, supplying Farnborough, Knockholt, Constitution Hill, and West Wickham. At Wilmington, a pair of compound rotative pumping-engines, with lift and force pumps, can deliver 8,000,000 gallons daily to Eltham. At Westerham, there is a water-wheel with pump which supplies 250,000 gallons daily to that town.

The latest addition to the works for the supply of water to London—the extensive scheme of reservoirs at Staines, which Messrs. John Aird and Sons are carrying out, in accordance with the plans of the author and his colleague, for the Staines Reservoirs Joint Committee—was next referred to. These works have been so fully described in the "JOURNAL," that all that need be said now is that the Contractors are making excellent progress with them. Additional storage is about to be provided by the Southwark and Vauxhall Company, who, under the advice of their Engineer (Mr. J. W. Restler), intend to construct at Molesey reservoirs of 1070 million gallons capacity, which, when completed, will give them the right to draw 20½ million gallons more water from the Thames. This will bring up the total permissible draft from the river to 185½ million gallons daily, apportioned as follows: Chelsea Company, 22; East London Company, 10; Grand Junction Company, 24·5; Lambeth Company, 24·5; Southwark and Vauxhall Company, 45; West Middlesex Company, 24·5; and Staines Committee, 35. The East London Water Company have, under the advice of Mr. W. B. Bryan, their Engineer, constructed large additional reservoirs, and have now before Parliament a Bill seeking powers for carrying out other extensions of their works. At the close of last year, the Companies had 871,949 supplies on their books, and 5254¼ miles of mains, engines equal to 26,723-horse power, and 129½ acres of filter-beds in use.

The rest of the paper, dealing with the quality of the water and the future supply, will be noticed, in connection with some remarks by the Chairman (Mr. W. Whitaker, F.R.S.), in a future number.

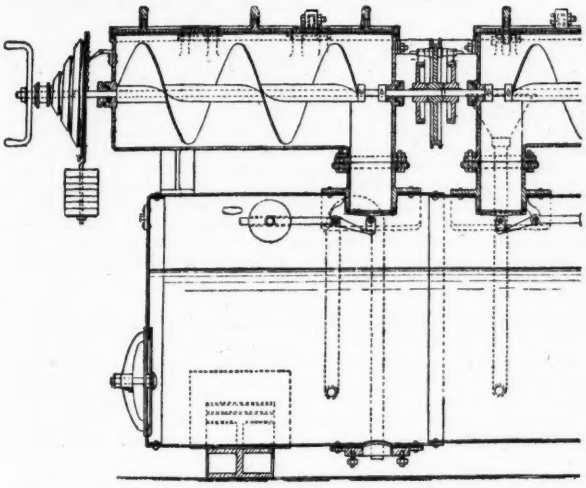
New Joint-Stock Companies.—The Solid-Cone Incandescent Light Syndicate, Limited, has been registered with a capital of £25,000, in £1 shares, to manufacture, import, export, sell, and deal in incandescent light apparatus, gas-fittings, lamps, burners, glasses, shades, &c. The object of the Swansea Compressed Gas Company, Limited, registered with a capital of £2000, in £1 shares, is sufficiently indicated by the title. The office of the Company is at Swansea.

The Carnarvon Town Council and the Extension of the Gas-Works.—Last Thursday, a special meeting of the Carnarvon Town Council was held to further consider the question of carrying out certain improvements at the gas-works. The report of the Gas Committee recommended that the plan and quotations of Mr. Woodall, who had examined the works, be adopted, and that application be made to the Local Government Board for sanction to borrow the sum of £1824. The Mayor (Dr. Parr) reviewed at length the history of the gas-works, and said that the balance of loans now outstanding was £18,995; the annual payment in respect of principal and interest being £1165. The amount it was intended to spend upon the works was £3096; and to meet this expenditure they had a depreciation fund of £1172, and a further £100 would be procured from another source—leaving £1824 to be borrowed. During the past ten years there had been an increase of 60 per cent. in the consumption of gas; and the price had been reduced from 4s. 6d. to 3s. 6d. per 1000 cubic feet. The capacity of the works was now exhausted; and it was absolutely necessary that the proposed improvements should be carried out. In the course of the discussion which followed, a question was asked as to whether the Gas Committee had considered it would not be advisable at some future time to introduce the electric light into the town. The Mayor expressed the opinion that if electricity were introduced it would be in the distant future. The recommendation of the Committee was unanimously agreed to.

REGISTER OF PATENTS.

Acetylene-Generator.—Szepczynski, S. de, of Vienna. No. 7838; April 1, 1898.

This acetylene-generator is designed for working continuously on a large scale. It consists (as shown) essentially of a water receptacle, over which a number of calcium carbide receivers are arranged. They communicate with the water receptacle by means of an opening capable of being closed by a valve, and through which the carbide is fed automatically into them by means of a conveyor-screw, actuated by the gasholder-bell according to the consumption of gas. The water receptacle is formed similarly to a steam-boiler; and over it are arranged (in the type illustrated) two calcium carbide receptacles, which are used alternately. They are U-shaped in cross-section, so as, on the one hand, to allow of the carbide being completely seized by a conveying-screw or worm, and, on the other, to permit the cover to be sealed gas-tight in a simple manner. The receptacles are in communication with the water-tank, through passages adapted to be closed gas-tight by valves moved by shafts which extend to the exterior through stuffing-boxes, and are provided with crank-arms—the valves being held in their closed position by adjustable weights.



On the shafts of the conveyor-screws or worms are keyed ratchet-wheels, which can be coupled with a loose pulley by putting into gear therewith catches or pawls mounted on the pulley—this being done when one or the other carbide receiver is to be set in operation. The pulley is connected by a cord with the gasholder-bell, in such a manner that it is rotated as the bell rises or sinks according to the generation or consumption of gas. When this rotation takes place in the direction of the arrow (corresponding to a descent of the bell), that ratchet-wheel is moved whose pawl is in engagement; and therefore also the corresponding conveyor-screw is rotated. In this way, the carbide is fed forward, and part of the charge next to it falls through the free opening into the water receptacle. If the bell rises by reason of the rapid evolution of gas, the cord yields and the pulley turns back, under the action of the counter-weight, without, however, allowing the cord to become slack, and without carrying the conveyor-screw with it, since the pawl or catch, if in engagement, will slide over the teeth of the ratchet-wheel during the rotation of the pulley or pawl-carrier in this direction.

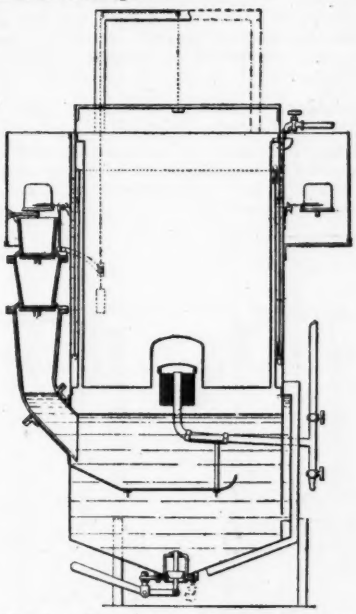
The advantages which are obtained by means of this apparatus are said to be as follows: The amount of water is very large compared with the amount of carbide supplied to it for the time being; consequently, detrimental elevation of temperature cannot take place, and no acetylene gas compounds (polymers) are formed. The generation of gas proceeds in proportion to the consumption, and very advantageously, since the carbide comes into direct contact with water, and the gas generated is thus washed in the column of liquid. The loss of gas is insignificant, and is limited to the capacity of the carbide receiver on filling, which operation can be carried out without interfering with the working. The renewal of the charge can take place at any time without interrupting the working. The arrangement for the continuous supply of water, and for the continuous removal of the used-up water and of the lime residue, is very important; this residue being for the most part carried off with the water, by allowing fresh cold water to flow continually into the water receptacle through a pipe-opening near the bottom of it, and preferably having its upper end funnel-shaped. This pipe serves as a safety-valve, and enables the deposit present to be stirred up by the entering water. The used water and the milk of lime are driven out through an ascending and descending pipe, syphon, or the like.

Producing Acetylene.—Javal, A., of Neuilly, France. No. 9319; April 22, 1898.

This apparatus is of the kind in which the calcium carbide falls into an excess of water; but its peculiarity is that the successive charges of carbide are introduced automatically in proportion as the gas produced is consumed. Condensation and evaporation of the gas are likewise automatic; and furthermore "there is always absolute protection of the charges of carbide carried by the distributor of the apparatus, until the moment that these charges are introduced into the generator."

As shown, the apparatus consists of a cylindrical chamber or vat, open at the top, and slightly conical at the bottom. In the upper half of the chamber is an inner wall, riveted at its lower edge to the walls of the chamber in such a way as to form an annular space for receiving water, into which dips the wall of a bell-cover, or rather a cylindrical outer wall which forms part of an inverted cover inserted in the chamber. This inverted bell-cover is open at its upper part; and its lower part has in its centre a small dome in which a part of the gas accumulates as produced.

At the lower part of the outer wall of the cover rollers are arranged, the axles of which are secured to the wall. They serve a double purpose—guiding the wall in the annular water-space, and preventing the lower edge of it from resting on the bottom of the space, and thus stopping communication of the water from one side to the other of the wall when the bell-cover is in its lowest position.



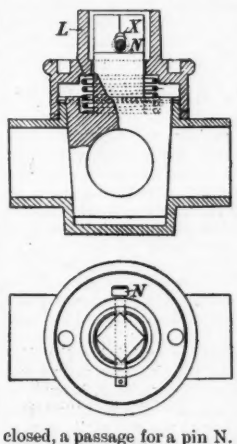
This communication of the water in the annular space from one side to the other of the outer wall is necessary when the bell-cover is lowered—that is, when no gas is enclosed in the apparatus—for feeding water into the arrangement. The water as supplied descends in the space outside the wall; flows around its base; rises inside the wall; flows over the top of the inner wall of the chamber; and finally descends between the latter wall and the cover into the lower part of the chamber.

The bell-cover, which works in the chamber in the manner of a plunger piston, is weighted so as to be balanced for the pressure which it is desired to give the gas—say, for example, from 50 to 120 mm. of water. At the upper part of the bell-cover is fixed a cross-piece, to which is attached a chain, passing over return rollers, and terminating in a counterweight.

The mouth of the outlet-tube for the gas is arranged in or below the small dome shown, in which part of the acetylene gas collects in proportion as it is formed. This outlet-tube terminates outside the apparatus in a vertical tube provided with two cocks, of which one serves to cut off the distribution of the gas, and the other to clear the apparatus of the enclosed air before it is put into action, and, in addition, to provide for the outflow of any condensed water which may have been carried into the tube by the gas. The mouth of the gas outlet-tube is arranged in the centre of a perforated guard or cage, which encloses the substance intended to purify the acetylene; while the upper part of the guard is of solid metal, and forms an additional means of securing condensation.

Gas Cocks and Valves.—Bocquet, A. E., of Maromme, France. No. 10,123; May 3, 1898.

The patentee claims that the cock described in this specification possesses numerous advantages, such as a direct passage equal to the section of the pipes used; a closed case preventing escapes of gas; and especially the doing away with a washer or nut as a means of tightening, and the use of a locking pin which absolutely prevents the plug of the cock from being moved in either direction, when the pin is inserted in the square of the cock, after the latter has been closed. Thus, if the pin is sealed the cock is safe against any escape, or abstraction of gas by a customer after the cock has been closed.



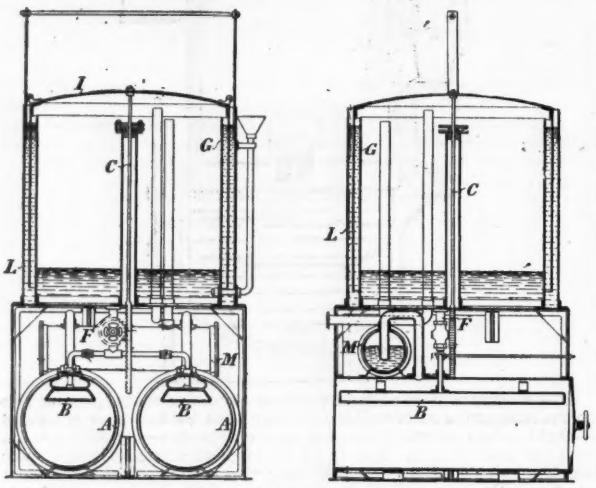
The stopcock is closed at its lower end, and has a projecting flange above screwed to receive a hollow cap. Between the plug, which has a passage equal to that of the cock and the cap, is placed a spring, the object of which is to allow of the hermetical closure of the plug in the shell of the cock, without in any way interfering with its proper working, by a "constant very gentle pressure." The plug is surmounted by a square or triangle forming a projection by which it is turned. This is enclosed in the upper part of the cap, which surrounds it, and renders necessary, in order to turn it, a special key consisting of a hollow socket, square or triangular as the case may be, and of a fork having at its end two nipples to fit in two holes made for the purpose in the cap, and serving to unscrew the latter in cases where it is enclosed. The hollow end L, as well as the square or triangle at the top, are perforated with rectangular holes rounded at their ends, forming, when the plug is closed, a passage for a pin N. The height of the hole through the plug is made a little greater than the diameter of the pin (as shown at X), so as

to prevent the possibility of the pin not being able to be inserted when the plug has, from use, worn further down in its seat. The diameter of the pin is exactly the same as the width of the holes, so as to prevent the plug being turned in either direction when once the pin has been inserted in the holes; and, further, the pin has at one end a hole in which is passed a piece of wire, by which the sealing is effected.

The pin serves as a security, in the sense that it can only be introduced when the cock is shut and the cap screwed down—the latter screwing from left to right. The cock is closed against its stop when turned from right to left; so that when once the pin has been passed through the hollow L and the square of the plug, as these two parts are stopped in opposite directions, the plug of the cock can only be turned after the withdrawal of the pin.

Producing Acetylene.—Haddan, R.; a communication from F. Vörö, of Selmeczbanya, Hungary. No. 10,141; May 3, 1898.

In this apparatus the quantity of the water admitted is continuously increasing or decreasing, according as the consumption of gas increases or decreases—that is to say, "the admission of water is bound to no limit of the present gas quantity."



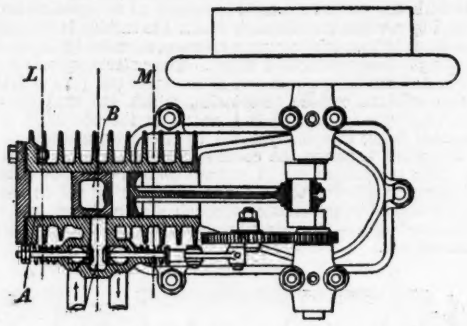
In the cylindrical receiver L is arranged a second receiver G, in such a manner that between the two there is a free annular space filled with water, into which the bell I dips. At the highest point there is fixed a rod C, formed at its under part as a toothed rod passing through the bottom of the receiver L. Under the receiver the gas-generator A is arranged. This consists of a horizontal cylinder provided at one end with a tightly closable door T, through which the carbide can be introduced. In the interior of the generator is a distributing sieve B, through which water is introduced by the pipe F, provided with a tap to be operated by a prolonged key fixed to a toothed wheel engaging with the toothed rod C. The outlet of the tap is constructed in such a manner that it requires a complete revolution of the wheel in order to gradually reduce or close the opening from the full open position to the complete closed position. The length of the rod C corresponds to a determined length of movement of the bell I, and is measured in such a manner that, at the engagement of the lowest tooth of the rod with the wheel, the tap completely closes the water-inlet; but the bell can still rise for a certain distance, so as to produce so much containing space as is necessary for the reception of the quantity of gas produced by the water still being in the branches of the pipe F after the complete closing of the cock. The admission of water is largest when the bell is in its lowest position, and is diminished continuously from this moment. When the bell, sinking from its highest position, brings the first tooth of the rod C into engagement with the wheel, the size of the passage is the smallest; but it is increased from this moment in proportion as the bell sinks. The regulation is thus exclusively dependent on the consumption of gas.

There is arranged over the gas-producers A a horizontal cylinder-shaped receiver M, filled to about the half of its diameter with water or other liquid. The tubes introducing the gas from the producers project into the receiver from above downwards, in such a manner that their openings are lying under the water-level. From the receiver a tube passes into the gas-receiver bell, from which the gas is conducted to the consuming apparatus or to a purifying apparatus. The receiver M effects a liquid closure, which prevents the gas from returning from the bell into the generator; and it is also able to cool and purify the gas.

Explosion Engines.—Chauvin, R. F. O., and Arnoux, R., of Paris. No. 11,235; May 17, 1898.

The patentees explain that, in explosion engines as at present constructed, the chamber containing the distributing valves, slide-valves, or equivalent parts, is in direct and permanent communication with the rear-end of the cylinder—that is to say, with the part at which the temperature of the gases is highest, and consequently most pernicious to the preservation of the materials of which the valves are constructed and to their fluid-tightness. "Indeed, these parts, necessarily of delicate construction, are subjected to the action of the gas at a very high temperature, which, by making the metal porous, gives rise to leakages, diminishes the power of the motor, affects the regulation of the compression and the firing, and, moreover, permits dangerous flashes of flame to pass through the admission valve into the carburetter."

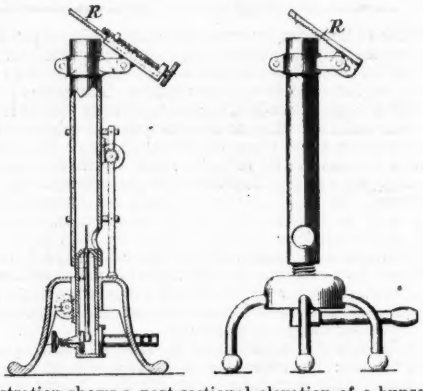
According to the present invention, the chamber containing the distributing valves is made to open into the cylinder (as shown), not at the rear end of it, but at a suitable part of its cylindrical wall, in such a manner that the passages leading into the chamber will be completely covered and closed by the piston when it arrives at the end of its stroke. Experience has shown that the openings provided in this part of the wall do not in any way interfere with the efficient working of the piston and its packing-rings. This new arrangement of parts—whereby the distributing-valve chamber communicates with the cylinder through an opening in the cylindrical wall suitably situated so as to be screened by the piston during part of its stroke—permits the piston to compress the explosive mixture in a practically air-tight closed chamber or *cul-de-sac* formed by the rear end of the cylinder and the piston, since the cylinder is no longer in communication with the chamber containing the distributing-valves.



In the engraving, which is a plan, partly in horizontal section, of an ordinary four-cycle engine having this invention applied to it, and provided with lift-valves as distributors, the inlet-valve is arranged in the body of the cylinder A opposite to the exhaust-valve. These two valves open into a chamber cast on the cylinder in such a position as to permit the piston B to entirely cover the entrance from the chamber to the cylinder when the piston arrives at the end of its stroke, compressing the explosive mixture. The inlet-valve opens automatically, and the exhaust-valve is actuated by a connecting-rod driven by a toothed wheel acting as a crank, and geared with a pinion keyed on the main-shaft—this pinion and toothed-wheel having a velocity ratio of 1 to 2. The lines L M indicate the extreme positions of the piston.

Increasing the Velocity of Bunsen Gas-Flames.—Glover, R. T. & J. G., of Clerkenwell. No. 11,573; May 23, 1898.

The patentees' proposal is to provide bunsen flame-tubes with a plate having an under roughened surface, and set at an angle over the mouth of the tube, for the purpose of breaking up or thinning down the flame for aërating purposes—producing thereby "a heat of greater intensity than is possible in the ordinary way;" the plate being arranged for adjustment.



The illustration shows a part sectional elevation of a bunsen burner-tube, with the invention applied, and set at the desired angle by a set-screw of the attachment band; also an elevation of a bunsen burner-tube, with the invention applied, and set at the desired angle by a side pinch-screw jamming the shank between two arms of the neck-band.

The under face of the plate R is recessed in lines, is coarse diamond or lozenge shaped, is in fine diagonal serrations, in concentric rings or parts of rings, or it may be formed with holes in the face for more effectively aërating the gas-flame by breaking it up, or by thinning it down, according to the shape of the plate employed.

Material for Impregnating Incandescent Mantles.—Stamm, A. E., of Elberfeld, Germany. No. 14,184; June 27, 1898.

The patentee proposes to add to the thorium which forms the base of the mantle a slight percentage of a double salt, consisting of 50 per cent. of vanadic anhydride (V_2O_5) and 50 per cent. of samarium-nitrate, melted together and added to the thorium in the proportion of about 0·6 per cent. of the mixture to 99·4 per cent. of thorium; "the mass thus formed being manipulated in the well-known manner to impregnate the hoods or mantles." It is asserted that the mantles thus formed "glow with a brilliancy which exceeds that of mantles made on any other system."

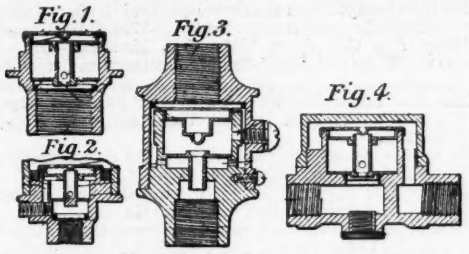
Gas-Governors.—Goodson, J., of Maze Pond, S.E. No, 24,293; Nov. 17, 1898.

This invention relates to the class of gas-governor which is usually connected direct to the burner, and in which the opening of a supply valve or passage is regulated by means of a floating diaphragm.

Fig. 1 (p. 1053) is a vertical section of a governor suitable for an ordinary burner. Fig. 2 is a governor provided with means for varying the supply. Fig. 3 is a governor suitable for down-current supplied to regenerative or other suspended lamps. Fig. 4 is an arrangement especially suitable for gas-stoves.

The casing (fig. 1) is provided with a broad cylindrical chamber, in

which works a floating diaphragm having a central tube working freely in a guide diaphragm fitting into the upper part of the centre chamber, and being surmounted by a cap having perforations for the passage of the gas to the burner. The chamber is placed in communication with the supply by means of a perforation in the centre tube. A gauze-wire diaphragm is stretched across the lower part of the chamber, and is firmly secured by a spring ring. So long as the supply

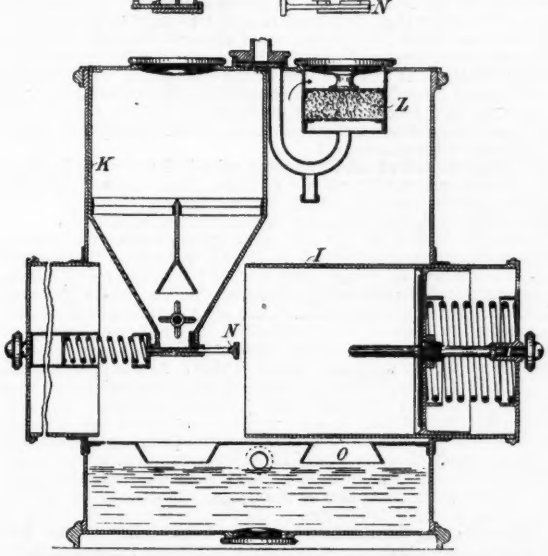


pressure is normal the float remains in its lowermost position—admitting a full supply of gas to the burner; but should the pressure be increased, it acts on the underside of the float and raises it, thereby causing the upper orifice of the tube to approach the valve-projection on the cap in the top chamber, and throttle the supply until the pressure is reduced to the normal—the rate of gas consumption being determined by the diameter of the centre tube or its inlet-orifice, as will be readily understood.

The construction and working of the other arrangements will be readily appreciated on reference to the sketches.

Acetylene-Generator.—Hilberg, E., of Berlin. No. 1796; Jan. 26, 1899.

In this arrangement of plant, the capacity of the generator increases or decreases according to the consumption or production of the gas, in such a manner as to maintain within it a constant pressure, by means of a piston contained within a cylinder one end of which opens into the generator—one side of the piston being acted upon by the gas, and the other by a helical spring. When the volume of gas within the generator decreases, the piston is forced inwards by its spring, until a rod or projection upon it comes into contact with a sliding valve at the bottom of the carbide container—the valve being opened and carbide falling into the generator. As fresh gas is produced, and the volume increases, the piston is forced back by the pressure and releases the carbide supply-valve, which is then returned to its closed position by the spring.



The illustration shows the generator in vertical cross section, with a longitudinal section and end elevation respectively of the carbide supply-valve and a stirring or agitating device.

K is the receptacle for the carbide, closed at the top by a screw-cap, and at the bottom with a sliding valve N. A cone H is suspended above the valve so as to relieve it of some of the weight of the carbide contained within the magazine K. The valve is normally maintained in its closed position by a spring, one end of which is contained within an extension of the reservoir. Opening into the reservoir is a cylinder I containing a piston, combined with a spring having a tendency to force it inwards. The gas has free access to the other face of the piston, but not to the face against which the spring abuts. When a large volume of gas is contained within the reservoir, the piston is forced (against the pressure of the spring) into the position indicated, or even still further to the right. As the volume decreases, owing either to the consumption of the gas or a decrease of production, the pressure decreases, and the piston is forced inwards by its spring and lessens the capacity of the reservoir. This inward movement continues until the piston-rod comes into contact with the valve N, and moves it to the left, so as to allow carbide to fall into the generator. As the production of gas increases and the pressure rises, the piston is forced outwards—thus increasing the capacity of the reservoir—and the carbide valve is returned by its spring to its closed position.

To prevent the carbide becoming caked, and to ensure that it is fed into the generator when the valve is opened, the latter is provided with stirring or agitating devices. The valve is formed with an external rack which engages with a pinion secured to a shaft carrying arms; and the reciprocation of the valve effects the rotation of the arms.

The carbide which passes through the valve N falls through a cone or funnel into the water at the bottom of the generator. The gas passes out through O; and on its way to the burners goes through the filter Z and pipe L.

Acetylene Apparatus for Railway Cars.—Duderstadt, F., and Kandler, M., of Leipzig. No. 1809; Jan. 26, 1899.

This invention, relating to acetylene gas-producers, has more particularly for its object to provide an improved apparatus for maintaining the lights in railway carriages. With this object, the patentees provide for a cylindrical casing containing an inner water-reservoir and a carburet holder, divided into successively operating sections by the flow of the water from the reservoir, in accordance with the needs of consumption. The cylindrical or outer casing serves at the same time as a holder to store the gas before it flows to the burners on the car. The apparatus is specially constructed and arranged to occupy only a small space, and to allow the various parts to be readily separated for charging water and carburet, for cleansing and repairing, or for any other purposes.

Incandescent Mantles.—Caro, N., and Saulmann, W., of Berlin. No. 2449; Feb. 3, 1899.

The patentees' claim is for a fabric for incandescent mantles in which the mesh is made narrower at the portion between the head and the body of the mantle (such fabric being either turned down on itself or having a strip of gauze sewn on it), so as to impart to the top portion a greater resistance by reason of the greater accumulation of impregnating material, and to enable the strengthening liquid, which could only be used for the head, to be applied to the portion in question.

APPLICATIONS FOR LETTERS PATENT.

7472.—Cowan, W., "Prepayment gas-meters." April 10.
7474.—Stevenson, G. E., "Coal-gas scrubbers." April 10.
7478.—Ybarrondo, D. de, "Incandescent gas-burners for street-lamps." April 10.
7505.—Birkbeck, H., "Automatic gas-lighter." A communication from the Peerless Gas-Lighter Company, W. Stern, and M. Sonneschein. April 10.
7509.—Guerrier, E., "Internal combustion engines." April 10.
7526.—Derval, E., "Furnaces for inclined gas-retorts." April 10.
7539.—Moore, G. A., "Acetylene-lamps." April 11.
7556.—Percy, C., "Acetylene-generator." April 11.
7566.—Bauer, A., "Internal combustion engines." April 11.
7571.—Green, T. W., "Rotary blowers or exhausters." April 11.
7574.—Léry, J. B. de, and Armington, W. A., "Gas-burners." April 11.
7576.—Baker, F. R., and Harrison, W., "Acetylene-lamps." April 11.
7598.—Boby, W., and Wigg, C. B., "Pressure-regulating valves." April 11.
7626.—Willcox, B., "Gas-engines." A communication from A. Wolf, jun., and Co. April 11.
7628.—Wheatley, W. H., "Combined stove-cover and gas-burner." A communication from W. H. Jordan. April 11.
7644.—Boulot, C., "Gas-burners." April 11.
7652-3.—Eissler, M., and Strache, H., "Valves for water-gas generating apparatus." April 11.
7671.—Robson, R., "Valves for gas-furnaces." April 12.
7674.—Heys, W. E., "Internal combustion engines." A communication from J. J. Heilmann. April 12.
7694.—Rust, J. L., and Lewis, J., "Gas-cookers." April 12.
7716.—Szepczynski, S. de, "Acetylene-generators." April 12.
7723.—Terény, J., and Uhlyarik, B., "Gas-generators." April 12.
7744.—Ledward, W. R., "Acetylene-generator." April 13.
7749.—Miller, R., and Beveridge, W. G., "Manufacture of acetylene gas." April 13.
7790.—Lion, A. L., "Purification of gases." April 13.
7823.—Sangster, C. T. B., "Internal combustion engines." April 14.
7862.—Hodder, A. E., and Lester, J. B. G., "Manufacture of gas." April 14.
7867.—Aktien-Gesellschaft für Theer-und Erdöl-Industrie and Kraemer, G., "Production of benzoic acid from coal tar oil." April 14.
7877.—Demuth, C., "Generating acetylene." April 14.
7897.—Oustalet, S., "Breaking coke." April 14.
7934.—Brown, A. B., "Gas-exhausters." April 15.
7935.—Rolfe, S., and Hornby, F., "Explosion engines." April 15.
7953.—Brookes, A. G., "Coin-freed machines for the sale of electricity, gases, or liquids." A communication from L. Sell. April 15.
7984.—Brunck, R., "Coke-ovens." April 15.

Reduction in Price.—The Directors of the Felixstowe Gas Company have decided to reduce the price of gas by 3d. per 1000 cubic feet.

The Fixing and Hire of Gas-Stoves at Bradford.—The Gas and Electricity Committee of the Bradford Corporation last Friday decided to fix gas-stoves free of initial cost to the consumer, and to make a charge of 10 per cent. on the outlay for the use of the stoves. The "Bradford Observer" thinks this ought "to increase the too moderate amount of business in that department which the Corporation have been able to do."

Proposed Extension of the Inclined Retort System at Leeds.—The Gas Sub-Committee who have charge of the York Street Gas-Works of the Leeds Corporation considered, last Friday, the question of introducing improved carbonizing plant at that station. In one of the houses two beds of retorts have to be renewed; and it was decided to recommend the General Committee to re-construct the building, and to adopt inclined retorts, in place of the horizontal hand-charged retorts now in use. It was stated that the installation at the Meadow Lane works had been very successful.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Gas-Works Management.

Sir,—There are many and varied subjects submitted to our Gas Associations for discussion; but none are more needed than the question of hours and wages to gas workmen, for although the work is uniform, there is no uniformity of management. Hence, gas managers are always more or less in trouble by having one demand or another pressed upon them. Most other traders regulate these matters upon a common principle; while gas managers leave themselves open to all sorts of offensive comparisons. In the case of stokers Mr. George Livesey and others have recommended gas managers to adopt a uniform rule, and secure its permanence by requiring the men in the Spring or Summer to sign agreements to serve their various terms at fixed wages, &c. But gas managers simply drift, and never reform, until they are unfairly attacked at times when they cannot afford to stop work. Surely something ought to be done in the direction I have suggested; for no body of workmen are better paid than gas workmen.

Perhaps the greatest offenders in this respect are the municipal authorities who own gas-works. It is upon these municipal authorities the labour agitators make their first attacks; and when unreasonable demands are granted, the comparisons are used to oppose companies. I do not here so much blame the managers as the municipal authorities who govern the managers, and who, by reason of themselves being dependent upon the popular vote, have not the courage, from various motives, to resist encroachments. Logically speaking, no man ought to have the municipal franchise who is in municipal employment, any more than workmen in a company should have the power to elect the directors of that company. The Government have just appointed a Commission to look into the working of municipal trading; and this is one of the features which the Commission should not overlook. The labour leaders thoroughly understand the weakness of municipal government in this respect; and when they want to make fresh demands, they always first make them upon the gas-works under municipal control. The labour leaders also shrewdly attack either singly or in sections, while gas management makes no sensible effort to defend itself.

Gas Director.

April 22, 1899.

Wooden Water-Pipes.

Sir,—A few years ago, when in Russia, we required a 4-inch main about 800 yards long, to bear a pressure of 30 lbs. per square inch. The pipes were made in lengths from trees about 10 to 14 inches in diameter, and 30 feet long, bored from either end with a cheese augur. The full size was got with three different sizes of augurs. The joints were easily made with a tin hoop, corrugated in the middle, and inserted between the outside of this pipe and the inside bore. The pipes were knocked-up with heavy mallets or tree-ends. The pipes, buried in sandy ground 3 feet deep, give no trouble either from frost or leakages, and were much cheaper than cast iron, chiefly owing to the cost of transit—being 30 versts from nearest railway station.

Thomas Owen.

Saltaire, Yorks, April 22, 1899.

The Jasper Incandescent Mantle.

Sir,—We have read the letter of the Automatic Lighting Company, Limited, on the above subject, in the "Journal" for the 11th inst., and must ask you to excuse us for troubling you again on the matter. It appears therefrom that the Company have not yet an apparatus to show. We are ready to demonstrate that the Jasper mantle, if worked by the patent, can never efficiently compete with any other thorium mantle. Silicum, taken by Mr. Jasper with thorium and cerium, affects considerably the light-giving power of the mantle, and even Dr. Auer von Welsbach uses nothing but the two latter constituents. It is impossible to get a solid mantle without spoiling the illuminating power. The Automatic Lighting Company seem to think we are jealous of the Jasper patent. We could, if we wished, use the same earths as are mentioned by Jasper, and finish off the mantle the same way; but we venture to assert that the system is good for nothing, just the same as all others, except the thorium and cerium system.

Oberfelt and Co.

Berlin, April 17, 1899.

The Assessment of the Penryn Gas-Works.—At a meeting of the Falmouth Union Assessment Committee on Saturday week, a report was presented on the subject of the recent rating appeals. It had been arranged that the decision in the Falmouth Gas Company's appeal should govern the assessment of the Penryn Gas-Works; and it was now stated that the rateable value of these works had been fixed at £144. The old valuation was £75 5s.; and it was raised by the Assessment Committee to £166.

The Gas Profits of the Manchester Corporation.—It was reported last Wednesday to the Gas Committee of the Manchester Corporation that the profit for the year ended the 31st ult. was (subject to audit) £67,482, or £16,281 more than the estimate. The sales of gas show £19,000, coke £9000, and ammoniacal liquor £4300 above the estimate, while tar has fallen short of the estimate by £1500. There has, however, on the other hand, been a large increase in the cost of material and the amount paid in wages. The cost of coal, cannel, and oil was £231,223, or £3223 more than was estimated. There will be a large increase this year in the cost of coal and cannel, in the amount of the sinking fund and interest, and in the cost of purification and other items, owing to the growth of the work of the Gas Department. It is estimated that the net profits for the current year will be £52,000, which it is proposed to pay over to the City Fund. The amount estimated to be expended on capital account for the current year is £91,800. Street lighting is expected to cost £47,500, from which will be deducted £2382—being the excess of the estimated over the actual expenditure for the past year; leaving £45,118 as the estimated cost for the current year.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

The Metropolitan Water Companies [Government] Bill was read the first time, and referred to the Examiners.

Other Bills brought from the Commons, read the first time, and referred to the Examiners were: Burley-in-Wharfedale Urban District Water Bill, Clay Cross Water Bill, Horsforth Urban District Council Water Bill, Ilford Gas Bill, Nottingham Corporation Bill, Nuneaton and Chilvers Coton Urban District Council Water Bill, Rhondda Urban District Council Bill, Stockport Corporation Water Bill, Stockport District Water Bill, Wetherby District Water Bill.

Bills read a second time and committed: Crowborough District Water Bill, Fishguard Water and Gas Bill.

Bills reported: Bognor Urban District Water Bill [preamble not proved], Mid Kent Gas Bill, St. Albans Gas Bill.

Bills read the third time and passed: Arbroath Corporation Gas Bill, Cambridge University and Town Gas Bill, Dumbarton Burgh Bill, Glastonbury Water Bill.

The oppositions to the Lowestoft Water and Gas Bill and the Stockton and Middlesbrough Water Bill have been withdrawn.

A petition against the Stockport Corporation Water Bill was presented from the New Mills Urban District Council.

The Church Stretton Water Bill, the Cobham Gas Bill, the St. Neots Water Bill, the Hastings and St. Leonards Gas Bill, the Newhaven and Seaford Water Bill, and the South Essex Water Bill were referred to a Select Committee—consisting of Lord Loch (Chairman), Earl Carnwath, Earl Romney, Lord Colchester, and Lord Wandsworth - to meet on Tuesday, April 25.

The Skipton Urban District Gas Bill, the Skipton Gas Bill, the Dundee Gas, &c., Bill, and the Wishaw Water Bill were referred to a Select Committee—consisting of Lord Wenloch (Chairman), Earl Clarendon, Earl Orford, Viscount Bangor, and Lord Cranworth—to meet on Tuesday, April 25.

HOUSE OF COMMONS.

Tuesday, April 18.

METROPOLITAN WATER COMPANIES [GOVERNMENT] BILL.

The third reading of this Bill, which was considered by the House in Committee on the 10th inst. (see *ante*, p. 982), stood second on the Government Orders of the Day on Monday last week; but it had to be deferred till to-day, when

Mr. A. J. Balfour moved—"That the proceedings on the Metropolitan Water Companies [Government] Bill have precedence this day of the Notices of Motions and the other Orders of the Day." He justified the motion by stating that, if the measure was to have its full utility, it ought to pass immediately, in order that the works it authorized should be at once put in hand and carried out before the possibility of any want of water should be felt in any part of the Metropolis. As the Bill had already passed the ordeal of first and second reading, as well as the Select Committee and the Committee of the Whole House, he hoped the time that would be withdrawn from private members' motions by the discussion would be of a trifling character.

After a few remarks from Mr. Lough, who had put upon the paper a notice of an amendment to read the Bill a third time that day six months, the House divided; and the motion was carried by 170 to 102.

Mr. Chaplin formally moved the third reading of the Bill.

Mr. Stuart said he did not rise to oppose the motion, for on no part of the procedure on the Bill had he opposed its object. He rose for the purpose of moving, as an amendment, that the Bill be recommitted, as there were in it faults of a serious character which called for further consideration. In the first place, there was a great departure from precedent, because the Bill gave to the Metropolitan Water Companies unlimited powers of borrowing without the sanction of Parliament; and it gave those powers for an unlimited period of time. In his opinion, it was not advisable that any Bill conferring such powers to such bodies should be passed without their case being placed before Parliament. It was true that the Bill was intended to deal with an emergency; but by its terms it was not limited to any such case. Any Water Company who had access to a large supply of water would have the power to supply other Companies without those Companies going to their own source of supply, and without the intervention of the House. He would be content if these powers were limited in time or amount, or if some other plan were devised of bringing this question before a Select Committee of the House of Commons when it arose. The Royal Commission mentioned £64,000 as the amount that might reasonably be expected to be used by the Companies in connecting their works; but the Companies had brought forward a scheme which would involve an expenditure of over £500,000. He strongly warned the House against this departure from precedent; but he would be satisfied if some limit were put into the Bill. Another point which called for recommittal was the omission of a sinking fund. What was the ground for omitting from the Bill a sinking fund whereby the ratepayers and water consumers would share in the profits of the new capital? It was said that this capital would not be remunerative; but how could that be predicated? Again, they would by the Bill give power to the Metropolitan Water Companies to supply water to any other Company in their own or any other district. If it were an error of drafting, he was all the more justified in proposing that the Bill should be recommitted. The object of the Bill should be clearly expressed; and surely it was that the Companies should not go outside the Metropolitan district. There was another point in respect of which the Bill went beyond what was proposed by the Royal Commission's interim report, upon which the Bill was entirely founded. In the 42nd clause of their report, the Royal Commissioners said they regarded their suggestions and recommendations as entirely independent of the other matters referred to them, and as in no way prejudicing the question of purchase of the Companies' undertakings or the question of control to be

exercised by local or other authorities, upon both of which questions they were prosecuting their inquiries. The House would observe that, while the Bill made provision in the case of purchase, there was no provision made in the case of control. Dangerous and difficult as the Bill might be in the former case, it would be extremely dangerous in that of non-purchase. He most ardently pleaded that there ought to be put into the clause some words which would sterilize the power of increasing capital value in case of non-purchase as well as in the case of purchase. He asserted, in conclusion, that the adoption of the suggestions he had made would in no way impede the operation of the measure as a means of meeting the state of urgency which it was declared existed.

Mr. CRIPPS said the purport of the Bill was to put a duty and obligation upon the Water Companies; and it was to make intercommunication of their systems for the purpose of preventing insufficiency of supply. The Local Government Board might make such orders as they deemed necessary for carrying out the object he had mentioned. It was felt that the obligation ought to be put on the Water Companies, particularly the East London Company, in order to prevent a recurrence of the grave misfortune of the last two or three summers. He denied that unusual power had been given to the Companies for the raising of money. The power was very carefully limited, and strictly in accordance with precedent.

Mr. STUART remarked that there was no limitation of period, and no sum was stated.

Mr. CRIPPS said the purpose for which the money could be used constituted the limit; and this purpose was restricted in the most effective way. He asked the House whether it was in accordance with precedent that, after a Hybrid Committee had carefully inquired into a Bill, it should be recommitted.

Mr. BUXTON said he thought his honourable friend was justified in moving his amendment, quite apart from the Committee itself; for they had had no opportunity of discussing the Bill. Neither the report of the Committee nor the evidence was in the hands of members; therefore they had no adequate opportunity of considering amendments. It must be perfectly obvious to anyone who read the evidence that the representatives of the London County Council were placed at great disadvantage; and he held that the Bill should be recommitted. As to the Bill itself, he was entirely in agreement with its general principle. It was necessary to prevent any danger of a water famine; but he did not think there was any urgency in regard to the passing of the measure. He hoped the right honourable gentleman the President of the Local Government Board would give them definitely the pledge—which he understood he did give on the second reading—that the Bill should be marked by an amendment introduced in another place as a distinctly temporary measure. As a temporary measure he had no objection to it; but as a permanent one he regarded it as very dangerous indeed. He hoped the operation of the Bill would be limited to five years, by which time the report of the Water Commission would be published, and steps could then be taken to settle the London Water Question.

Mr. CHAPLIN said his honourable friend who had just spoken complained that no fit opportunity had been given for discussing the Bill. He had always treated the Bill as one of great urgency; and he was therefore entitled to consider that honourable gentlemen were aware that it would be proceeded with on any day on which it appeared on the notice-paper. It was also said that no time had been given for the consideration of amendments. There was one whole day upon which those who desired to do so might have placed amendments on the paper. But, as a matter of fact, amendments had been discussed in Committee. The honourable member also said there was no urgency in regard to the Bill, because the works required to carry out the objects of the Bill were already done. He was misinformed on this point. Some of the works which were urgently required had to be stopped because the necessary powers to enable them to be continued were needed. Everything in regard to the water supply in East London depended, of course, on the weather. But he was not prepared to run any risk whatever, which he could possibly avoid, of a recurrence of that great calamity, the water famine of last year. He could not, therefore, accept the proposal for the recommittal of the Bill. So great was the press of Government business, that if the Bill were to be recommitted he did not know when he should be able to obtain another day on which to bring it on again; and the prospect of its passing into law this session would be doubtful. The clause relating to the sinking fund was retained in the Bill, and the ground upon which he defended it was that it was a recommendation of the Royal Commission who had taken evidence on the subject. These works were in one respect of a totally different character from all others contemplated by the Metropolitan Water Companies, because they were works which the Companies might be ordered to make by a Government Department, whether or not they desired to make them or would be profitable when carried out. In these circumstances, it would have been harsh treatment of the Companies if the views of the Royal Commission had been over-ridden. All the borrowing powers in the Bill were to be subject to the Local Government Board; and that Department would not call upon the Companies to spend money on works which were not absolutely necessary. The honourable gentleman the member for Poplar (Mr. Buxton) had asked him to give a pledge that until the report of the Royal Commission was received he would not sanction any more schemes on this subject which were not absolutely necessary, and which could not be accomplished by the expenditure of a smaller amount of money. After all that occurred last summer, he was very anxious to avoid committing himself upon this subject. If the Bill became law, it would cast considerable responsibility upon the Local Government Board; and he did not wish to give pledges that might unfortunately fetter his hands if any unforeseen contingency should arise. The request was, however, entirely in accordance with his intentions, and with the views of the Board, so far as they were able to forecast the future. They did not contemplate that anything more than the kind of expenditure which the honourable member had suggested was likely to be required at present. Clause 3, which provided that the Companies should not derive any advantage, in the event of purchase, from having made these communications, was inserted in order to remove any possibility of doubt on that question. He had endeavoured to give his reasons why the Government could not agree to recommit the Bill; and he hoped honourable gentlemen opposite, all of whom had said they were not opposed to the Bill in principle, and did not wish to arrest its progress, would allow it to be read a third time.

Mr. LOUGH said the right honourable gentleman had suggested that this was a most urgent matter, because it was necessary to deal with emergencies arising in the East-end of London. There was, however, nothing in the Bill about the East-end of London. No one would object to it if it were limited to that district. The Bill applied to the whole of the Metropolitan district; and therefore it should be looked at from the standpoint of other parts of the Metropolis that might be injuriously affected by it. Evidence had been given before the Committee and the Royal Commission that the emergency in the East-end had been adequately dealt with; and that difficulty was but a pretext for thrusting this Bill on the House. What was the origin of the Bill? They were told that it was a Government Bill; but, strictly speaking, it was the Water Companies' Bill which had been taken up by the Government for the purpose of carrying out the Companies' policy. The provision requiring the sanction of the Local Government Board to the raising of money was very poor protection indeed.

Mr. H. SAMUEL appealed to the House not to sanction the recommittal of the Bill. Honourable gentlemen opposite took up a contradictory position, especially the honourable member for Poplar, who asserted that he was in accord with the principle of the Bill, and yet did everything he could to delay its passing into law. He said the delay of a week or two, or a month or two, would have no effect. But was not this the same argument that was adduced by honourable members in 1893 and again in 1894, when by their refusal to sanction works that were necessary for the construction of reservoirs they forced East London to go through a series of famines? He protested against this course of conduct, and thanked the Government cordially for having at last arrived at the conclusion that East London was entitled to a proper water supply.

Mr. STEADMAN said he not only represented an East-end constituency, as did the honourable member who had just spoken, but also lived in it, and had had his share of the famine. Though he did not quite agree with the course taken by the Local Government Board, he admitted that it was a remedy for the time being; and rather than incur the risk of a repetition of the suffering the working classes in the East-end of London had endured in past years, and after the assurance given by the President of the Local Government Board that the Bill, if passed, would enable him to force the East London Company to give a constant supply, he, in the interest of his constituency, should vote for the third reading.

Mr. STUART said he understood the order of procedure in the House of Lords would admit of the points he had urged being dealt with in Committee; and he therefore asked leave to withdraw his amendment.

Leave being refused, the amendment was put and negatived, and the Bill read the third time and passed.

The following further progress has been made with Bills:—

Bills read the first time, and referred to the Examiners: Arbroath Corporation Gas Bill, Cambridge University and Town Gas Bill, Glastonbury Water Bill.

Bills read a second time and committed: Airdrie and Coatbridge Water Bill, Herne Bay Water Bill, Lanarkshire (Middle Ward District) Water Bill, Lea Bridge District Gas Bill, Perth Water, Police, and Gas Bill, Walton-on-Thames and Weybridge Gas Bill, Yeadon and Guiseley Gas Bill.

Bills reported: Brigg Urban District Gas Bill, Rushden and Higham Ferrers District Gas Bill, Scunthorpe Urban District Gas and Water Bill, Shotley Bridge and Consett District Gas Bill.

Bills read the third time and passed: Burley-in-Wharfedale Urban District Water Bill, Clay Cross Water Bill, Ilford Gas Bill.

The East London Water Bill, the East London Water (Temporary Supply) Bill, the Metropolitan Water Companies Bill, the West Middlesex Water Bill, the London Water (Finance) Bill, the London Water (Purchase) Bill, and the London Water (Welsh Reservoirs and Works) Bill have been referred to a Select Committee, consisting of Sir Joseph Pease (Chairman), Mr. Arnold Forster, Mr. Nussey, and Captain Bagot; to meet on Tuesday, April 25. On the motion of Dr. Farquharson, it was ordered—"That it be an instruction to the Committee on the East London Water Bill and the East London Water (Temporary Supply) Bill that they have power, if they think fit, to consolidate the said two Bills, or any part or parts thereof respectively, into one Bill."

THE IMPROVED GAS LIGHTING OF LONDON STREETS.

General RUSSELL, the Member for Cheltenham, on Friday asked the First Commissioner of Works whether there was any prospect of the improved system of gas lighting, which has been introduced "with such excellent results" into the Mall of St. James's Park, being extended to other portions of the public parks and thoroughfares, and whether there was any means of compelling the Local Authorities to improve in a similar manner the lighting of streets throughout London.

Mr. AKERS-DOUGLAS, in reply, said: I shall be glad to extend the system of lighting, lately introduced into the Mall, into other thoroughfares under my control as funds are available. My hon. friend will have noticed that a considerable sum is again voted in this year's estimates for improving the lighting of the parks. I would invite his attention also to the improvement I have lately effected in this direction in Trafalgar Square. As regards the streets in charge of Local Authorities, I am unable to make any statement, as the matter is altogether outside my jurisdiction.

Alluding to the above question and reply, the "Westminster Gazette" says "it recalls one of the most striking incidents of the connection of St. James's Park with gas illumination. At the Peace Rejoicings of 1814, after the temporary conclusion of the long war with France, a Chinese bridge and pagoda on the canal there were to be specially lit with the then recent illuminant. But, unhappily, the bridge caught fire; and though the gas was put out without explosion, every part was thrown into smouldering darkness. David Pollock, a barrister of the period, who was about the earliest efficient promoter of the introduction of gas, the first successful experimenter with it in his own dwelling, and for thirty years Governor of The Gaslight and Coke Company, had left his circuit specially to come to town to witness the triumph of the new light. But he was so mortified by the accident that he hurried back into the country. It may be regarded as a coincidence that when another new illuminant in the shape of the electric light was brought into use in St. James's Street in connection with the decorations at the Diamond Jubilee, a not dissimilar fiasco occurred."

HOUSE OF COMMONS SELECT COMMITTEE.

Thursday, April 20.

(*Sir* JAMES RANKIN, *Chairman.*)

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.

To-day, the first meeting was held of the Select Committee appointed last session, and re-appointed in the present session, "to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and to report as to the method in which those powers have been exercised having regard to the differences of price charged by the various Companies." The first witness called was

Sir COURTENAY BOYLE, K.C.B., *Permanent Secretary to the Board of Trade.*

He said he had intimate acquaintance with the powers of Gas Companies. He had prepared for the information of the Committee a memorandum supplemental to, and bringing up to date, information contained in an old memorandum of his predecessor, then Sir Thomas Farrer, and explaining the history of the London Gas Companies during the last few years. In 1860, the Metropolis Gas Act was passed, which regulated the supply of gas to the Metropolis, and divided London into certain areas under the control of various Companies—then thirteen. The history of the Gas Companies from 1860 to 1876 was set out in the memorandum of Sir T. Farrer. Witness proceeded to refer in some detail to the history of the Companies as regarded legislation from 1875 up to the present time. In 1875, the gas supply of the Metropolis was in the hands of nine Companies; but there was a good deal of discontent and complaint, and the Board of Trade were asked to move. The Metropolitan Board of Works in that year introduced three Bills into Parliament—one for the erection of competing gas-works, another for the purchase of the existing undertakings, and a third for imposing more stringent regulations on the Companies. The first two were, however, dropped. The third was referred to a Select Committee, by whom it was amended. A sliding-scale of price and dividend was provided; the standard price being fixed at 3s. 9d. per 1000 cubic feet for 16-candle gas. Owing to the late period of the session, however, the Bill did not pass. In the same year—1875—a Bill promoted by the Commercial Gas Company was passed, adopting a sliding-scale price of 3s. 9d. per 1000 cubic feet. Witness went on to explain what a sliding-scale and standard price were, and how they operated; pointing out that the important thing in settling the powers of a Company to charge was the fixing of the standard price. In applications to the Board of Trade for Gas Provisional Orders, the effort of the promoters was naturally to get as high a standard as possible; the object of the consumers being the reverse.

The CHAIRMAN: Is there any maximum laid down in the Acts of Parliament for price?

Witness: No, with this qualification: Where the standard price and the sliding-scale system obtain, there is no maximum; but sometimes there is no sliding-scale at all—only a maximum.

Examination continued: In London the sliding-scale applied all round. In the autumn of 1875 and the beginning of 1876, negotiations took place which resulted in several Bills being introduced in the latter year. By this time the number of Companies had been reduced to six. Three—The Gaslight and Coke, the Commercial, and the London—supplied north of the Thames; and four—the South Metropolitan, the London, the Phœnix, and the Surrey Consumers'—supplied south of the Thames. The limits of the London Company extended to both sides of the river. In that year The Gaslight and Coke Company obtained an Act embodying the legislation which had been made applicable in 1875 to the Commercial Company, including the standard price of 3s. 9d. per 1000 cubic feet. The South Metropolitan Company also introduced a Bill to provide for a standard price of 3s. 9d. for 16-candle gas; but the Committee decided that the standard price should be 3s. 6d. per 1000 cubic feet, and inserted a clause enabling the Company to amalgamate with any other Company south of the Thames. This Bill became law. The London, Surrey, and Phœnix Companies were subsequently amalgamated—the London with The Gaslight and Coke Company, and the Surrey and Phœnix with the South Metropolitan Gas Company—by Orders in Council, dated 1883, 1879, and 1880 respectively. Turning to the complaints which had led to the present inquiry, witness said that in 1894, owing to the different prices charged by the three Companies, representations were made to the Board of Trade by a number of Vestries and from various public meetings in favour of a parliamentary inquiry into the management, working, and statutory obligations of the Companies, with a view to securing uniformity of charge. At that time, there was a difference of 8d. between the prices charged by The Gaslight and Coke Company and the South Metropolitan; the figures being 3s. 1d. and 2s. 5d. per 1000 cubic feet respectively, and that of the Commercial 2s. 7d. In August, 1894, the then President of the Board of Trade (Mr. Bryce) received a deputation of Vestry representatives and other complaining parties; and in October of the same year the Board were informed that, at a conference of Vestries and District Boards, it had been decided to petition Parliament for a parliamentary inquiry in preference to a departmental inquiry. The agitation then appeared to have quieted for a time—owing presumably to The Gaslight and Coke Company having reduced their price from 3s. 1d. to 2s. 10d. per 1000 cubic feet, and abolished meter-rents. In 1898, the Company increased their price from 2s. 10d. to 3s., which revived the agitation; and in June last the House of Commons decided to appoint a Select Committee of Inquiry. This Committee, however, was appointed too late in the session to commence the inquiry. The actual price now charged by The Gaslight and Coke Company was 3s. per 1000 cubic feet, and this being 9d. less than their standard, entitled the Company to pay 2½ per cent. above the standard dividend, or 12½ per cent. But as in the Company's district south of the Thames, the charge could not be more than that of the South Metropolitan Company, the present price there was only 2s. 2d.; and as the Company could not charge more for public lighting than the lowest price charged to any private consumer, the price for public lighting all over their district was 2s. 2d. The price charged by the South Metropolitan Company was 2s. 2d. per 1000 cubic feet, which, being 1s. 4d. less than their standard, entitled them to pay a dividend of 14 per cent. The price charged by the Commercial Company was 2s. 6d. per 1000 cubic feet—1s. 3d. below the standard—enabling them to pay a dividend of 13¾ per cent. In order not to complicate matters, witness ignored the recently authorized conversions of the capital of The Gaslight and Coke and South Metropolitan Companies. The gas was in all cases of 16-candle power. Witness drew attention to a table giving the prices charged for gas from 1876 to 1899; showing that they were gradually reduced by the three Companies till 1889, when the figures were: The Gaslight and Coke Company, 2s. 6d. per 1000 cubic feet; the South Metropolitan Company, 2s. 3d.; and the Commercial Company, 2s. 4d.—these being the nearest approach to uniformity ever attained. Subsequently to 1889, they had to increase the price, owing to the greater cost of coal and to labour troubles. Another table put in by witness gave a list of cities and large towns supplied by gas companies subject to a maximum price. As a general rule, he said, the maximum price, where it existed, was higher than the standard price, where the sliding-scale was in operation. Obviously a maximum beyond which the company could not go in any circumstances ought, in fairness to the companies, to be rather higher than the standard price. A further table gave the prices charged in cities and large towns where the gas supply was in the hands of the local authority. These statements appeared to show that the price now charged by The Gaslight and Coke Company was but 2d. less than in 1882, as compared with reductions of 8d. and 6d. by the two other London Companies; that outside the Metropolis the reductions between 1882 and 1897 had averaged appreciably more than 2d.; and that while the price now charged by The Gaslight and Coke Company was 6d. in excess of that charged in 1889, the prices charged by a number of companies and local authorities were about the same, and in some instances lower than in 1889, but that in no case had the increase amounted to so much as 6d. The illuminating power of the gas supplied must be not less than 16 candles. Witness went on to describe in detail the duties of the three Gas Referees who were appointed by the Board of Trade to prescribe and certify the mode of testing the illuminating power, pressure, and purity of the gas supplied, the number and situation of the testing-places to be provided by the Gas Companies, the apparatus and materials to be used therein, and the number and times of testing. They also prescribed the maximum amount of various impurities allowable in the gas. There were fifteen testing-places for The Gaslight and Coke Company, two for the Commercial Company, and six for the South Metropolitan Company. The Companies paid the remuneration of the Referees and the expenses of the testing-places. The latter were under the control and management of the County Council or of the City Corporation, according to their situation.

The CHAIRMAN: I understand you believe the chief reason for dissatisfaction and agitation is the difference of price charged by The Gaslight and Coke Company in north and south London?

Witness: Yes.

Is the agitation widespread?—Complaints did reach the Board of Trade prior to the appointment of this Committee; but since the appointment of the Committee they have ceased, because the complainants knew they would be inquired into by a competent body. The complaints received came chiefly from public bodies north of the Thames.

Have the public bodies presented any objection to the existing law?—It is difficult to answer that question without referring to the different representations. Of course, there are some who desire that Parliament should revise the bargain made with the Companies in 1876, and that there should be a uniform rate throughout the whole Metropolis, an abolition of meter-rents, and a reduction of standard price or standard dividend. The agitation, I think, is directed mainly against the price—not against the other provisions of the law.

Have you any suggestions to offer for the improvement of existing regulations, or do you think on the whole they are satisfactory?—I think the existing regulations work satisfactorily.

Have you had any objection taken with regard to the areas covered by the different Companies?—No, I think not. Practically the geographical division of the Metropolis is accepted as a *fait accompli*, and there is no endeavour to alter that. I have no doubt some of the Companies would wish to get larger areas; that is only natural.

Are there any objections made against the action of the Referees?—Oh! well, all judges are complained of. In the opinion of the Board of Trade, they have done their work very competently.

Can you give us any reason why The Gaslight and Coke Company secured that portion south of the Thames?—No, I am afraid I cannot. It has been a long-standing arrangement. There are some people who think there should be more competition; but Parliament has practically left that arrangement alone.

Have you anything you wish to say to us with regard to the question of sinking fund?—Sinking fund, no; reserve fund, possibly. The Gaslight and Coke Company could not pay their 10 per cent. dividend a little while ago, and found it necessary to draw upon their reserve fund for the purpose.

Is this an arrangement that the Board of Trade object to?—Well, it is difficult to say. If Companies can put by a reserve fund for other years, it really amounts to paying more than the dividend. At least, it is arguable that it amounts to paying more than the dividend. It is a very difficult question; and I should be sorry to give an authoritative opinion on it. I think it stands to reason that if Companies can put by a certain sum to reserve fund, it is paying a little bit higher dividend. I am not, however, finding fault with the Company.

You draw a distinction between a reserve and sinking fund. I should like a little explanation?—A sinking fund is a fund to pay off debt.

The Board of Trade, I understand, have no particular views in regard to this question of sinking fund?—No.

I want to know whether the Board of Trade wish to advance any objection to the present regulations, or to bring forward any others?—I think not.

By Mr. COHEN: The Referees' duties do not apply to the price, but simply to the illuminating power, pressure, and purity of the gas.

Mr. COHEN: Can you give any explanation of how it is that the Companies who charge the least according to your table make the most dividend?

Witness: Indeed, I cannot—it is the application of the sliding-scale. That is one of the questions for the Committee.

By Mr. STEADMAN: He would not say that the reduction in the hours of labour that took place in 1889 had been the cause, in the case of The Gaslight and Coke Company, of the subsequent increases in their charge; but undoubtedly the difficulties with their employees, and the necessity of making further arrangements with them, added to the cost of the production of gas.

Mr. STEADMAN: You are still of that opinion, though your own tables show they are at present paying ¼ per cent. more dividend than in 1884, 1885, and 1886?

Witness: Yes.

Mr. PIRIE: Has the present absence of competition in the Metropolis acted detrimentally to the consumer?

Witness: It is a very arguable point. I should say it has. Where there is competition, the tendency is to keep prices down. On the other hand, competition is open to certain objections—the danger of allowing too many people to break up streets. Already the number of persons who can do this is very great.

By Mr. BRYNMOR JONES: Great elements in the cost of production were the prices of coal, labour, and residuals.

Mr. BRYNMOR JONES: Have you considered whether it would be possible, instead of having this sliding-scale arrangement, to have the price of gas fixed automatically with reference to the price of coal?

Witness: I do not think that is feasible, because there are so many other factors.

Have you formed any opinion whether it is best to have the manufacture of gas undertaken by a company or by a local authority?—I should hardly like to express an opinion.

Sir ANDREW SCOBLE: Is there any reason to believe coal costs more in the north of London than in the south?

Witness: I should say it costs less in the north of London.

By Mr. BALDWIN: He knew of no large district in the United Kingdom where competition in the supply of gas was allowed.

By Mr. PICKERSGILL: He thought there was no precedent for the clause in the scheme authorizing the amalgamation of The Gaslight and Coke Company (who had powers of supply both south and north of the Thames) to the effect that the Company "shall not charge in the districts of the London Gaslight Company south of the River Thames a higher price per 1000 cubic feet of 16-candle gas for either public or private lighting than the price for the time being charged by the South Metropolitan Gas Company." This clause was the foundation for the charge which had been urged against the Company in some quarters, that, if they could afford to supply gas at a lower price south of the Thames, they could do so north of the river also. In Gas Bills, the method of a standard price was very often adopted; but sometimes there was a maximum. The standard price differed according to the size and importance of the Company—the cost to the Company of the production of gas. He should not think it was to be inferred from the proceedings of Parliament in fixing the standard price of the South Metropolitan and The Gaslight and Coke Companies that the difference in price between the two Companies was never to exceed 3d. per 1000 cubic feet. Generally speaking, since 1894 the complaints had been as to price; some minor ones had reference to failure to supply.

Mr. PICKERSGILL: Have objections reached your department with respect to the illuminating power of the gas?

Witness: Objections have been made as to the measurement of gas by the County Council—that there should be improvements in the photometer. We have been urged to adopt a better standard for measuring the gas.

Was not the ground of these representations that the illuminating power was below the statutory limit?—That is so. After the agitation in 1894, the price of The Gaslight and Coke Company was reduced; and it was raised again in 1898.

Would it not be a fair inference that the reduction was in consequence of the agitation?—If the two facts were connected.

Do you consider that the procedure now followed with regard to testing is satisfactory?—I do not see my way to improve it. The Gas Referees are very able men.

What I mean is this: Are you satisfied that the illuminating power of the gas in the pipes, which the consumer has alone to consider, is really the same as that of the gas which is taken at the testing-stations?—I think very possibly it deteriorates; and therefore a portable photometer for testing at the consumers' premises might be very useful. I think the arrangements for testing are improvable; but it is a scientific question. If accurate testing could be done occasionally at the consumers' premises, it might tend to improve the quality of the gas.

Would any statutory change be necessary to force that on the Companies?—No; I think it could be done under the present law.

By the CHAIRMAN: It seemed to him one of the great questions was if possible to get a uniform charge all over the Metropolis. The Board of Trade, however, brought forward no reason why the charge should be uniform.

Mr. H. E. HAWARD, *Comptroller of the London County Council*,

traced in some detail the steps leading up to the present legislative position. He said that prior to the year 1860, the Metropolitan Gas Companies were regulated by the Gas-Works Clauses Act of 1847, which settled the maximum dividend for the Companies generally at 10 per cent., allowed them to make up the deficiency of dividend in former years, and gave them power to accumulate a reserve fund of one-tenth their nominal capital before reducing the price of gas. At this time, the gas supply was furnished by a large number of Companies, who, in certain districts at least, were in keen competition with each other. But in 1853 the Companies south of the Thames, and in 1857 the Companies north of the Thames, made certain arrangements for terminating the competition, and divided the Metropolis into districts of exclusive supply, much after the manner of the Water Companies at an earlier date. Very high charges for gas followed, numerous complaints were made, and a long inquiry ensued, which resulted in the Metropolis Gas Act of 1860. This Act limited back-dividends to six years—a *quid pro quo*, as it were, for giving the Companies certain settled districts—and fixed the price of gas at a maximum of 4s. 6d. per 1000 cubic feet, which price, on appeal, could be raised to 5s. 6d. This Act enabled the Companies to pay large dividends. The next important step was the Select Committee of 1866, who inquired into the working of the Act of 1860, and into the City of London Gas Bill, by which the Corporation sought to establish a competing supply. This Committee recommended, *inter alia*, that the minimum illuminating power should be increased and the maximum price of 4s. 6d. reduced; and that the power to make up back-dividends should be limited to three years. Then came Mr. Cardwell's Committee of 1867, who considered the Metropolis Gas Bill promoted by the Board of Trade as an amendment of the Act of 1860, and who contemplated fixing the maximum at 3s. 6d. per 1000 cubic feet for 14-candle gas, but limiting the dividend to 7 per cent. where this price was charged, with a sliding-scale for an increased dividend where the rate actually charged was below the maximum. This was the first mention witness had been able to find of a sliding-scale. Negotiations took place; but as the Companies would not agree to the proposals of the Board of Trade, they were dropped. The general conclusion of the Committee was "that the Act of 1860 and the arrangements which it sanctions have been eminently favourable to the Companies, while the interests of the consumer have been very inadequately protected;" and witness drew special attention to the fact that, in the opinion of this Committee, the Companies were only entitled to their 10 per cent. dividend after exercising due care and management. The views of Mr. Cardwell's Committee were substantially embodied in the City of London Gas Act of 1868 and the Companies' Acts of 1869. Witness then briefly referred to the events leading up to the legislation of 1875 and 1876, and went on to allude to the powers of the Companies to pay dividends. The proportion of dividend allowed to be paid by The Gaslight and Coke Company was not altered by the recent conversion of their capital. North of the Thames the Company could charge private consumers any price they chose, provided they suffered a reduction of dividend of 5s. per cent. for every penny by which they increased the price. South of the Thames they must not charge a higher rate than that of the South Metropolitan Company for the time being. There was no rule bringing the charge of the South Metropolitan Company to that of The Gaslight and Coke Company, should the latter be the lower of the two. The clause in the Amalgamation Scheme reducing the charge of The Gaslight and Coke Company south of the Thames to the level of that of the South Metropolitan Company was quite novel. The object of the sliding-scale, he continued, was to ensure proper care and management on the part of the Companies, by giving them a strong interest in the reduction of expenditure. If the shareholders did not take sufficient interest in their undertaking, and see that it was economically and well and properly carried on, the consumers would have to suffer. An instance of this was afforded at a meeting of The Gaslight and Coke Company not very long ago, where, instead of the 12¾ per cent. which had been paid for some years, only 12½ per cent. was declared. Mr. Livesey, as a shareholder, made a strong protest; but nothing effective in the way of changing the management was done. The shareholders seemed very little concerned in the loss of the ¼ per cent.; but the extra 2d. per 1000 cubic feet the Company put on the price meant the taking of £175,000 a year from the consumers, in addition to what they had been previously paying. Witness went on to point out the immense benefit the sliding-scale had been to the Companies, who ever since 1876—when it was established—had been paying increasing dividends. These dividends had never fallen below 10 per cent. The scale applied to all the old capital raised before 1876, as well as to new capital. In other words, on the old capital on which they had only been able to divide 10 per cent., they secured the advantage of being able to divide more than that. He calculated that the three Metropolitan Companies had divided, since 1876, in consequence of the sliding-scale, an extra sum of upwards of £3,000,000; this being the bonus which the consumers had had to pay for the benefits (if any) of the sliding-scale, because under the old arrangement the whole of this sum would have been available to reduce the price of gas.

Mr. GILLIAT: That is assuming the maximum and the standard are the same?

Witness: Yes.

Mr. GILLIAT remarked that the maximum was usually higher; so that it did not quite follow that if there had been a maximum instead of a standard there would have been this effect.

Witness (continuing) went on to point out that the cost of coal had enormously decreased since 1876; the price per ton paid by The Gaslight and Coke Company in 1875 having been 20s. 10d., and in 1897 11s. 2d. There had been similar reductions in the case of the South Metropolitan and the Commercial Companies. On the other hand, the value of residual products had diminished; so that the reduction in the net price of coal was not so great as in the gross cost. The abolition of coal dues in 1889 meant a saving to the three Companies of £145,000 a year. The fact that the Companies strongly opposed the sliding-scale in 1875 showed they thought it would not work favourably to them; but the contrary had been the case. The Board of Trade, in laying down the principle on which the sliding-scale and initial price were to be fixed, stated that regard should be had to the prospects both of the Companies and of the consumers. It was very doubtful whether, in 1875 or 1876, this aspect of the matter was considered, because when the Metropolitan Board of Works introduced their Bill they put in 3s. 9d. for the standard, but only on the basis that the dividend was to be decreased and not increased. The alteration in the sliding-scale was made while the Bill was in Committee. Since then large reductions had been made in the price of gas; but unless one supposed that the £3,000,000 already referred to would have been wasted, this sum, or part of it, would have been available to further reduce the price, because under the old system everything the Companies earned over 10 per cent. went to reduce it. He would not go so far as to say that the consumers have not been so well off under the sliding-scale as they would have been under the arrangement of fixed dividend. All he wanted to point out was that the reductions that had been made since 1875-6 had not necessarily been in consequence of the sliding-scale, but that there might have been reductions to the same or even a greater extent under the old system. Under the sliding-scale, in consequence of the great increase in the sales of gas, as compared with the growth of share capital of the Companies, the proportion of every £100 of increase in net profits going to the consumers was larger than it used to be, and consequently the proportion going to the Companies was less. While this was satisfactory in one respect to the consumers, it had the effect that the sliding-scale was a less powerful incentive to the Companies to economize than formerly, because they

did not get so much by it. While in 1876, in the case of The Gaslight and Coke Company, the consumers' share of every £100 of increased profits was 82·3 per cent., in 1898 it was 85·3 per cent.; the Company's proportion having correspondingly decreased. One could quite conceive a position in which the shareholders became merely preference shareholders, while the consumers were ordinary shareholders. Turning to the subject of amalgamation, witness said that some eight Companies had amalgamated with The Gaslight and Coke Company. Generally the opinion formed at the time was that these amalgamations were not advantageous to the consumers. The Companies with whom The Gaslight and Coke Company amalgamated were generally speaking more successful, and in a more prosperous condition, than the larger Company; and as a result the prosperity of the smaller concerns seemed to be lost in the amalgamation. He quoted figures of the Imperial and Independent Companies—the first two with whom The Gaslight and Coke Company amalgamated after 1875—showing that before amalgamation their position was far better than that of the bigger Company, and that therefore consumers might have looked for reductions after the amalgamation. It did not, however, appear that the consumers gained—indeed, in the district of the Independent Company they suffered, because the price was immediately raised from 3s. 6d. to 3s. 9d. per 1000 cubic feet. The amalgamations of the South Metropolitan Company with the Surrey and Phœnix Companies were of an opposite character and resulted in the price in the districts of those two Companies—who were in a less prosperous condition than the South Metropolitan Company—being reduced to the lower level of the South Metropolitan Company. The present charges for gas consumed by prepayment meters were: The Gaslight and Coke Company, north of the Thames 3s. 9·4d., south of the Thames 3s. 4d. per 1000 cubic feet; the South Metropolitan Company, 3s. 1d.; the Commercial Company, 3s. 4d. Since Dec. 31, 1898, the South Metropolitan Company had announced their intention of reducing the price to prepayment consumers by 2d.; following which The Gaslight and Coke Company ought to make a reduction to their prepayment customers. These figures were much above the ordinary charges; but witness pointed out that they included a great deal more than the mere charge for gas. The County Council, subject to any explanation which The Gaslight and Coke Company might make as to further powers in any of their Special Acts, were of opinion that the Company were not carrying out, in regard to the charge for gas supplied through their automatic meters, the clause to the effect that they should not charge South of the Thames more than the South Metropolitan Company.

Mr. Pickersgill (referring to a paper he held in his hand) said the Company professed to charge the statutory price for their gas; putting the difference under the head of fittings.

Mr. Cohen: I understood you, Mr. Haward, to say that the hire of the fittings was included in the price charged for this penny-in-the-slot gas?

Witness: That is so.

Mr. Cohen: If that be so, I do not see how this claim on behalf of the Company comes in.

Sir A. Scoble: The curious thing is they charge 4½d. more for their fittings on the south of the Thames than on the north.

Witness went on to point out that the supply of gas through these meters was very important, especially to the poorer classes. In 1898, The Gaslight and Coke Company had about 100,000 slot meters out; and the gas used in this way was about one-fourteenth of the total consumption of the Company. The South Metropolitan Company had 80,115 slot meters out, which accounted for one-eighth of the total consumption of that Company.

The Chairman: Would you explain what is the advantage to the consumer of these automatic meters?

Witness: I think it was found that before the meters were introduced gas was not consumed at all by the persons who now take gas in this way. These consumers were not prepared to pay meter-rent, and go to the expense of the necessary fittings; and therefore they did not burn gas at all. But the Companies now supply the meter and all the fittings, and allow the consumers to pay in smaller amounts for gas—a penny at a time, instead of quarterly; and the result is that the poorer classes are able to burn gas where in former days they were unable.

But apparently at a considerably higher rate?—Yes; but then the Companies have to do more for them than for ordinary customers. They supply all the fittings, and have to arrange for the collection of the pence from these meters. The demand for automatic meters has increased very much in the last year or two.

In further examination, witness compared the charges of The Gaslight and Coke Company with those of the other Companies. Since 1876, this Company's charges had considerably exceeded those of the South Metropolitan Company, and, as a general rule, those of the Commercial Company. Since the year named, The Gaslight and Coke Company had reduced their price by 9d. per 1000 cubic feet—from 3s. 9d. to 3s.—besides which they had abolished meter-rents, which made the reduction equal to 9¾d., or 21 per cent. For the same period, in the case of the South Metropolitan Company the reduction was 1s. 2¼d., or 34·5 per cent.; and in that of the Commercial Company, 1s. 3d., or 33 per cent. The difference between The Gaslight and Coke Company's and South Metropolitan Company's charges in 1876 was 3¾d. per 1000 cubic feet, whereas now it was 8¼d.; and, while in 1876 The Gaslight and Coke Company's charges were the same as those of the Commercial Company, the former was now 5¼d. more than the latter. The difference was tending to increase; the figure of difference in 1889 between the South Metropolitan Company and The Gaslight and Coke Company being 3d. per 1000 cubic feet, and in the succeeding years 4¼d., 5¼d., 7d., 7¾d., 7¾d., 5¾d. (in 1895), 6¼d., 6¼d., 8¼d., and 9¼d. The lessening in price by 3d., to 2s. 10d., in 1895, was due to the great agitation against the Company on the north of the Thames; but the Company did not wait to see whether, with this reduced price, they could earn their full statutory dividend of 12¾ per cent. to which they became entitled by the reduction, but promptly proceeded to divide it. To do this, however, they had to use a portion of their balance, and a large slice of their reserve fund. In the three years 1895, 1896, and 1897, they divided £339,000 more than they earned; £255,000 of this sum coming from balance of revenue, and the rest out of reserve. The prudent course would have been to have waited, in order to see if they could earn the increased dividend, before dividing the full statutory limit. A comparison of The Gaslight and Coke Company's charges with those of the Suburban Companies, showed that out of four semi-Metropolitan Companies, three—the Crystal Palace, Mitcham, and Wandsworth—charged less, and one—the Brentford—more, than The Gaslight and Coke Company. Out of nine Companies wholly outside London, only four charged more than the Chartered Company. While all these Companies had made reductions in price the last fifteen years—ranging from 31⅓ to 7½ per cent.; the average being 18¾ per cent.—The Gaslight and Coke Company were now charging practically the same as in 1884, apart from the ¾d. taken off in meter-rents. A comparison of the Company's charges with those in various provincial towns—both in cases where the concern was owned by a company and in those where the management was by the local authority—showed, generally, that the provincial charges were less, and that the present prices in these instances were their lowest; whereas with The Gaslight and Coke Company the price seemed to be rising. Witness then gave in detail particulars of the capital authorized, raised, expended, &c., of the three Companies.

Witness was still under examination when the Committee adjourned till next Thursday.

HOUSE OF COMMONS COMMITTEE.

(*Before Sir* John Brunner, *Sir* G. Fardell, *Colonel* Welby, *and Mr.* W. Jones.)

BRIGG URBAN DISTRICT GAS BILL.

This Bill, which is to empower the Brigg Urban District Council to acquire the undertaking of the Brigg Gas Company, Limited, and to raise the money necessary for the purpose, came before the above-named Committee last Tuesday.

Mr. Balfour Browne, Q.C., the Hon. J. D. Fitzgerald, Q.C., and Mr. E. H. Lloyd appeared for the promoters; Mr. Shiress Will, Q.C., and Mr. Ernest Moon represented the Brigg Gas Company, the only petitioners against the Bill.

In opening the case, Mr. Balfour Browne stated that the Bill was to empower the Urban District Council of Brigg to supply gas and to provide for the compulsory transfer to them of the undertaking of the Brigg Gas Company. The Company was formed in 1836; but, having no statutory power of supply, the concern was not regulated in the interests of the public. He would not make any complaint of the way in which the undertaking had been managed, but would admit for present purposes that the Company had done their duty fairly well, and had supplied gas, which had been a boon to the locality. They had been successful; having paid 10 per cent. dividends until two or three years ago, when a change in management took place, and instead of paying 10 per cent., the Directors reduced it to 8 per cent., in order to form a reserve fund, which now stood at £800. In June last a circular was issued to the shareholders intimating that the Company proposed to go to Parliament for a Provisional Order giving them statutory rights; and it was this which brought to a head the idea of purchase. There was no case, Counsel continued, where a non-statutory company had applied to Parliament to be converted into a statutory undertaking, and where at the same time the local authority were promoting a Purchase Bill or were applying for a purchase clause, and where the application of the local authority had been refused; but there were a large number of precedents for the course now proposed.

The witnesses called in support of the Bill were the Chairman of the District Council (Mr. Jonathan Spring) and one of the members of that body (Mr. Barker Symes) and Mr. E. H. Stevenson. The Company's petition was supported by the Secretary (Mr. F. C. Hett).

At the close of Mr. Hett's evidence, a consultation took place between the parties, the result of which was an announcement by Mr. Shiress Will that his friend Mr. Balfour Browne was willing to agree to clauses similar to those in the Yeovil Act of last session, an alteration in the payment of compensation to servants to twelve years, and the payment of a portion of the expenses of the Provisional Order. He added that clauses would be submitted, and that the Committee would not be troubled with any contentious matter. Mr. Balfour Browne explained that what had been done was to secure to the Company full payment for their works and compensation to certain servants. He said he should have resisted the payment of the costs of opposition to the Bill, because he did not think it was justified. But he could not say the Company were not justified in applying for the Provisional Order; and so the Council thought it fair to allow them something towards the expenses of that, and they had given £200. The works would now come into the hands of the Council.

The Chairman said he presumed he might take it that the Order would be dropped; and Mr. Shiress Will replied that he thought it followed.

The preamble of the Bill was then declared proved.

On the following morning clauses embodying the arrangement come to were considered, and accepted. They set forth that the Council must, within six months of the passing of the Act, require the Company to sell and transfer their undertaking to the Council; the purchase to be completed and the transfer carried into effect within three months from the date of the award of the arbitrator, or at such earlier date as might be agreed in the event of arbitration not taking place. The clauses contained a section requiring the Council to compensate old servants of the Company who have been in their employ twelve years and upwards, instead of fourteen years and upwards as was previously contemplated.

SCUNTHORPE GAS AND WATER BILL.

The Committee then proceeded with the consideration of this Bill, which is to empower the Scunthorpe District Council to construct gas-works, purchase mains from the Frodingham Iron and Steel Company, and raise the necessary money.

The Hon. J. D. Fitzgerald, Q.C., and Mr. W. Shakespeare appeared for the Council; Mr. Balfour Browne, Q.C., and Mr. Wedderburn, Q.C., for the Iron and Steel Company.

In opening the case, Mr. Fitzgerald said the purpose of the Bill was to enable the promoters to construct and maintain gas and water works, and for other purposes. The District Council were now carrying out water-works, and so far as this part of the Bill was concerned there was

no opposition, as it was considered eminently desirable that a place with a population estimated at 6690 should have a supply of water. Coming to the next part of the Bill, Counsel narrated the history of the gas undertaking in the hands of Messrs. Cliff, of the Frodingham Steel and Iron Company, who now supplied not only their own works, but the railway and a large proportion of the householders in the district. Last year Messrs. Cliff promoted a Bill by which it was proposed to convert their gas undertaking into a company, and to obtain statutory powers for the supply of gas, not only in the district of Scunthorpe, but in the adjoining district of Frodingham. They put the value of their works at £4000, and proposed to sell the works to themselves, as a statutory Company. The two District Councils of Scunthorpe and Frodingham opposed the Bill; and Mr. Littler, who then appeared for the Scunthorpe Council, intimated his readiness to take over the pipes and mains in that place and pay for them, but he made it quite clear that he would not buy the gas-works as a going concern. Ultimately the Council agreed to pay Messrs. Cliff £500 on these terms. The words of the agreement of purchase made between the parties were ambiguous; Messrs. Cliff arguing that the arrangement was for the Council to buy their mains as a going concern. Supposing they were earning £500 a year by the pipes and mains taken over by the Council, they would ask the arbitrator to give them not merely the value of this plant, but 15 or 20 years' purchase as well. The result of this would be that the Council would be saddled with material they had no intention of buying. The Council objected to paying for the goodwill.

At this point, Mr. Wedderburn interposed the remark that Messrs. Cliff required an independent engineer to determine not only what they would have to part with, but also to fix its value.

Continuing, Mr. Fitzgerald said there was opposition from the Frodingham District Council. But the promoters had arranged to continue the supply of the portion of Frodingham now being served from the works; and a provision had been inserted in the Bill to enable the Frodingham Council to buy from the promoters the mains in their district at the price at which the promoters purchased. A third opponent of the Bill was a landowner named Parkinson, who objected to the site proposed to be used for the gas-works. But the promoters intended to appropriate for the purpose lands of their own, and not to take anyone else's land.

The Chairman of the Scunthorpe Council (Mr. J. Fletcher) and Mr. E. H. Stevenson gave evidence in support of the Bill.

Mr. Balfour Browne then addressed the Committee on behalf of the contentions of the Frodingham District Council, who objected to the Scunthorpe Council intruding into their district for the purpose of supplying gas to the railway station, the hotel, and a few other houses, which are now supplied by the Iron and Steel Company.

After consulting for some time in private with his fellow-members, the Chairman announced that the Committee had decided to accept the promoters' clause, undertaking to re-sell to the Frodingham Council the mains and pipes in their district; leaving to an engineer to be named by the Local Government Board the decision of the value of the distributing and working plant of the Company, without allowing anything for goodwill.

Considerable discussion on other points followed; and eventually the Committee decided to pass the preamble—leaving the site for the gas-works as proposed in the Bill, and fixing the maximum charge for gas at 4s., instead of 4s. 6d.

HOUSE OF LORDS COMMITTEE.

(*Before the Earl of* Camperdown, *Chairman, the Earl of* Stamford, *Lord* Sinclair, *Lord* Newton, *and Lord* Wimborne.)

NENE VALLEY WATER BILL.

This Bill, the object of which was the construction of works in the Nene Valley for the purpose of supplying water to the inhabitants of several parishes in the locality, came before the above-named Committee on the 23rd ult. It was opposed by the District Councils of Raunds, Thrapston, and Wellingborough.

Mr. J. D. Fitzgerald, Q.C., and Mr. Adkins appeared for the promoters; Mr. Blennerhassett, Q.C., represented the District Councils.

In opening the case, Mr. Fitzgerald said the Bill was to incorporate a Company and to authorize them to construct works for the supply of water to a considerable district in the Nene Valley, including Higham Ferrers, Finedon, and Raunds. As showing the character of the district, and that it was composed largely of the working-class element, he mentioned that it contained 6482 houses, out of which number 5232 were rated at £8 10s. or under. The various Local Authorities, especially those of Higham Ferrers and Finedon, had been endeavouring to supply themselves singly; and the result most of them had arrived at was that, partly owing to geological conditions, and partly to the small rateable value, it was almost impossible to do so. After describing the character of the proposed works—viz., a well and reservoir—Counsel said the expense was very much beyond what any one district could undertake singly. Messrs. Seaton and Beer, of Westminster, heard of the difficulties which these people were in at the beginning of last year, went down into the district, and suggested to the Local Authorities the formation of a Joint Board. The difficulties in the way were found, however, to be enormous, owing to jealousies between the various bodies, from the fact that they were anxious not to be involved in what seemed to them very considerable expenditure; and the attempt fell through. Thereupon the Engineers laid their scheme before other gentlemen, who thought they saw in it a reasonable prospect of a return for the investment of their money. These gentlemen were not connected with the district, and this was, in a sense, an engineers' scheme; but they had the support of two of the most substantial districts in the area for carrying it out. The capital proposed to be raised by the Company was £64,000, with borrowing powers to the extent of £16,000. While Counsel was reading the petition of the Finedon District Council, the Chairman drew attention to the fact that the main point was that it was contrary to public policy that the water supply should be taken out of the hands of the Local Authority and put into private hands. The various Authorities objected to being all united together against their will.

The Mayor of Higham Ferrers (Mr. Owen Parker), the Medical Officer of Health for the town (Dr. John Crewe), the Chairman of the Finedon District Council (Mr. Hawthorne), and others, having giving evidence, Mr. E. P. Seaton, one of the originators of the scheme, was called. He stated that when he first went into the district and told the Local Authorities what he proposed to do he was received with open arms. It was after they had accepted the principle of the scheme that he put himself in communication with the gentlemen who had since formed the Company who had purchased his plans. The reservoir he proposed was to be of such a size that if the whole population of the district were served at the rate of 20 gallons per head per day, five days' supply would be available. The proposed charge to consumers would be 2d. per week on all houses up to a value of £8 10s. In cross-examination, he said that at the first meeting of the Local Authorities his partner, Mr. Beer, stated that if any one of them wished to be left out of the scheme, they would not be included in the Bill. He was not now willing to exclude Thrapston and Raunds, because they had at first shown a willingness to be included. Mr. Seaton was followed by Mr. J. B. Leonard, who said his firm's business was that of providing money for the construction of railways and other works. They had had submitted to them the scheme of Messrs. Seaton and Beer, and regarded it as a feasible and profitable one; and the gentlemen associated with him—Captain Willett and the Hon. R. C. Devereux—were in a position to find the money for carrying it out. In reply to the Chairman, witness said the raising of the capital was assured, but it was not underwritten. He and his colleagues, who were the Directors of the Reversionary and General Security Company, would find it.

The Committee then adjourned.

On the resumption of the proceedings the next day, Mr. Fitzgerald stated that he had been considering a question his Lordship put early in the case, as to whether they could agree to Thrapston being taken out of the Bill. They had tried to see if they could make a workable scheme without including Thrapston, and they were now willing to cut out the whole of it, except Stanwick and Addington, where the works were to be, and where it would be necessary to lay a main. The parliamentary estimate for the scheme was £26,000; but for the purpose of laying the mains, if the district were curtailed as suggested, a less sum would be required. The Chairman asked Counsel what had caused the promoters to change their minds since the previous day, when they were absolutely certain that it was essential that Thrapston should be retained. Mr. Fitzgerald said that, as the main opposition came from Thrapston, they had endeavoured to find a workable scheme which should omit that place, in order to put an end to the opposition.

Professor Boyd Dawkins was then called. He said he thought the scheme propounded by the promoters was a good one. He explained the geological strata through which the well would be bored, and the probable quantity of water that would be obtainable. To sink deep wells into impervious strata was the only method by which they could be assured of obtaining water of good quality. The surface waters of the district were to a large extent contaminated. Mr. J. Eunson, Engineer to the Corporation of Northampton, followed. He said he had seen the sections of Professor Boyd Dawkins, and his own practical experience of sinking corroborated them in every respect as to the geology of that neighbourhood. A good supply of water would be obtainable from marlstone. In cross-examination, he acknowledged that in borings at Rushden, on the south side of the river, he was disappointed in his expectation of finding water.

This closed the case for the promoters. After deliberating in private, the Chairman announced that the Committee were of opinion that it was inexpedient the Bill should proceed. An application made on behalf of the petitioners for costs against the promoters, on the ground that they had put the opposing Local Authorities to needless expense, was rejected.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* Baldwin, *Chairman, Mr.* Strachey, *Mr.* Hazell, *and the Hon.* Evelyn Cecil.)

WETHERBY DISTRICT WATER BILL.

This Bill, which is to enable water to be supplied by a Company to certain parishes in the rural districts of Wetherby and Tadcaster, came before the above-named Committee on the 21st ult. It was opposed by the Corporation of Leeds.

Mr. Balfour Browne, Q.C., Mr. Wedderburn, Q.C., Mr. Keen, and Mr. Dickinson appeared for the promoters; the Hon. J. D. Fitzgerald, Q.C., and Mr. Horace Marshall represented the Corporation of Leeds.

In opening the case, Mr. Balfour Browne said the districts concerned were rural and widely scattered; there being 28 parishes in the two districts. The Wetherby district contained 65,758 acres, and in 1891 had a population of 14,984 persons; while that of Tadcaster contained 72,857 acres, with a population of 25,977. The population were in little groups of villages, and these required a supply of water; and the promoters proposed to supply the districts, with the exception of Harewood, where they would have works and wells, but which was within the district of the Leeds Corporation. They had certain works, and among them a well, which Lord Harewood considered might injure the water supply of his property; and the Company had agreed that if his source were affected they would supply him with water in substitution. Their scheme provided for three pumping-stations and a reservoir. There was only one petition against the Bill, and that was from the Corporation of Leeds. The promoters thought the proposal they had made to the Leeds Corporation should have satisfied them. Under clause 40 of the Bill, the promoters took power to supply the Local Authorities with water in bulk beyond the Company's limits; and the Leeds Corporation had objected to this. The parish of Shadwell was beyond the limits of the Corporation; and though the promoters had struck out every parish in which Leeds had the right of supply, the Corporation very unreasonably claimed to serve Shadwell. In his opinion, such a monstrous proposal was not to be considered. The promoters had given up the fourteen parishes which were in the Leeds district; but there was no reason why they should be required to give up the places asked for.

The Chairman of the Wetherby District Council (Colonel Gunter, M.P.)

then gave evidence in support of the Bill. He said he had been one of a deputation who waited upon the Leeds Council to see if they could supply them. He believed they were offered some waste or surplus water from one of the reservoirs; and the price was to be 4d. per 1000 gallons. The deputation also asked for some guarantee for a continuous service; and he understood that the reply was that they could only have it so long as Leeds did not want it. In cross-examination by Mr. Fitzgerald, witness said he was not sufficiently acquainted with the details to say whether a district 20 miles long and 18 miles broad could be served by a Company with a capital of £50,000. For his own part, he had no objection to Leeds having a concurrent right of supply in the district. He only desired, as Chairman of the District Council, to have an efficient service; and he remarked that he was not interested in the new Company. Mr. Gerald A. Perry, the Engineer of the scheme, gave details of the proposed works. He said there would be three wells and a water-tower, 600 feet above Ordnance datum, which would be high enough to supply the whole district. They proposed to get all the water from the millstone grit. It was estimated the cost of the works would be £35,000, which they considered ample.

The Chairman of the Water Committee of the Leeds Corporation (Alderman Cooke) was called in opposition to the Bill. He said the water supply of Leeds had cost £1,250,000. The scheme was intended not only to supply Leeds, present and future, but also the surrounding districts. They expected to supply both Crossgates and Shadwell, residential districts of the city. Since 1896, important additional works had been made at an expenditure of £17,000 or £18,000, mainly in view of the needs of the latter place. He did not think it just that Leeds should be deprived of these districts. The Corporation were ready to supply Shadwell at once, and he thought the residents would regret it if they did not avail themselves of the Leeds water. In cross-examination, witness said that there had been a difficulty in supplying Shadwell on account of its height; but this had been overcome. They supplied water in bulk to Hunslet, and they passed part of it on to Crossgates.

Mr. Wedderburn contended that Shadwell had never been supplied by Leeds, and Crossgates was only supplied by the Hunslet Authority. He asked the Committee to pass the Bill as it was.

After a short consultation, the Chairman stated that the Committee had unanimously decided that the preamble was proved.

The clauses were then gone through, and the Bill was ordered to be reported.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* BALDWIN, *Chairman, Mr.* STRACHEY, *Mr.* HAZELL, *and Mr.* EVELYN CECIL.)

HORSFORTH AND BURLEY-IN-WHARFEDALE WATER BILLS.

The Horsforth Urban District Council Water Bill, the Horsforth Water Bill, and the Burley-in-Wharfedale Urban District Water Bill came before the above-named Committee on the 21st ult. The Horsforth District Council wished to acquire the local water-works; the Water Company resisted the attempt, and sought power to construct new works; and the Burley-in-Wharfedale District Council promoted a scheme affecting the gathering-ground which the Company proposed to take.

Mr. BALFOUR BROWNE, Q.C., and Mr. A. J. RAM appeared for the Horsforth District Council; Mr. PEMBER, Q.C., and Mr. FITZGERALD, for the Water Company; Mr. WORSLEY TAYLOR, Q.C., Mr. CLAUDE BAGGALLAY, and Mr. F. PEMBER, for the Burley-in-Wharfedale Council.

The case for the Horsforth District Council was opened by Mr. Ram, who said the schemes contained in the three Bills before the Committee must be taken to be in competition with each other. The Bill promoted by the Council he represented was to enable them to purchase the undertaking of the Water Company. The Company had promoted a Bill to obtain power to extend their works; and the Urban District Council of Burley opposed it by a Bill of their own. He then traced the history of the Company's undertaking; saying that they obtained their powers primarily under an Act of 1865 to supply the area called Horsforth. Their capital was £8000, with borrowing powers, which had all been exercised; and they had a total capital, including borrowed money, of £14,500. Their power to get more money was exhausted, and they had no reserve fund. Horsforth—once a place without much population—had changed its character, and was now a suburb of Leeds, where some of the richer citizens resided. From a very early period in the history of the Company, there had been grave complaints of the way in which the water had failed to satisfy the consumers. It was the management that was to blame for the shortcomings in quantity and quality. He gave illustrations of this; and said that about one-fourth of the total area which ought to be supplied from the works could not be provided for, because the whole of the water required could not be procured by gravitation. There had been frequent negotiations for sale. In 1885, the Company asked £41,000 for the works, &c.; but the Local Authority did not see their way to giving this sum. He cited the report of Dr. Bruce Low, of the Local Government Board, to show the unsatisfactory nature of the water, and the absence of the necessary filtration. The Company had, he said, neglected to provide the remedies required by the officer of the Board. In September, 1898, another attempt was made to purchase; and the Company said they were willing to sell, on terms. But they always asked an exorbitant price, or attached unfair conditions. Therefore, the promoters of the Bill had no alternative but to come to Parliament. There was only one petition against the Bill, and it was from the Company, who said they did not wish to sell. They said they were seeking power to construct a reservoir and raise capital. But he replied that they were trying to deprive Burley-in-Wharfedale of its own natural watershed, and that their scheme was costly and unnecessary. The Bill of the Council he represented did not propose any new works, as they could increase their supply without coming to Parliament for fresh powers.

The first witness called was Mr. E. J. Silcock, who described the existing works, and said that 700 acres out of the area of 2800 acres to be supplied could not be served by them because the filter-beds were at too high an elevation. The gathering-ground needed most careful watching to prevent impurity of the water. The population of Horsforth was 7700. The present supply worked out to only 14 gallons of water per head, which was insufficient. He had examined the pipes of the Company, and had found them to be defective. In some cases leakage was going on, which would account for the loss of water which had occurred. Again, the pipes were not laid at sufficient depth. He criticized adversely the Horsforth Company's scheme, both in regard to finances and filtration facilities, and said it would be a costly undertaking, requiring an outlay of £40,000, which was not justified by the water it would yield.

On the following day, Mr. Silcock was cross-examined by Mr. Fitzgerald. He said he did not exactly condemn the existing gathering-ground of the Company; but, as he had said, he considered it should be very carefully watched. He had no objection to the gathering-ground, as such, proposed by the Company; but he thought it would be improvident to spend so large a sum as £40,000 upon such a supply as they proposed to get.

The next witness was the Medical Officer of Health for the West Riding County Council (Mr. J. R. Kaye), who stated that in October, 1896, there was a serious outbreak of enteric fever among the inhabitants of the urban district of Horsforth. He examined water drawn from one of the pipes, and found it to be unfit for drinking. He also inspected the gathering-ground of the Company, and discovered that the streams were polluted; and he came to the conclusion that it was more than likely that this caused the fever. In December he reported that the water supply demanded the urgent attention of the District Council. Under the threat of legal proceedings, something was done to remedy the evil complained of; but there were other important matters which required attention. Mr. Kaye was followed by other witnesses who supported the Bill; and then came Mr. Henry Doughty, a farmer, and formerly caretaker at the water-works, who said that no fresh sand was put in the filter-beds all the time he was at the works. There was only one pure-water tank there. This should have been cleaned out every three months; but it was not done more often than once every six months, or even twelve months. Mr. Doughty was followed by Mr. James Mansergh, who gave evidence in favour of the Bill. He said it was clear from the evidence that the Company had not been doing well; and it was also clear to his mind that they had not been unwilling in the past to sell their works if they could get what they considered a sufficient price. Mr. Silcock's estimate of the probable cost of the proposed new works of the Company was certainly not too high. In his opinion, it would be a very great hardship to force upon the Local Authority as one of the terms of purchase the taking over of a scheme which they considered would be costly and ineffectual.

This concluded the case for the Council.

Witnesses were then called on behalf of the opposition of the Water Company. Mr. C. Roberts, the Secretary, gave evidence as to the works carried out, and said that measures had been taken to prevent contamination of the water. He denied that the mains were in a defective condition. The Company could not look upon the Yeadon supply as permanent, and he said they ought to get a fresh gathering-ground and new works. Mr. A. Harrison, of Yeadon, stated that 200,000 gallons of water a day, at 6d. per 1000 gallons, could be spared from the Yeadon supply for Horsforth. Mr. H. A. Johnson, of Bradford, supported the opposition. He said a scheme which was dependent upon wells was quite untrustworthy.

At the opening of the proceedings on the third day, the opposition of the Water Company was continued. Mr. Charles Gott, of Bradford, was the first witness called. He said he did not agree with those who had stated that Yeadon might become a permanent source of supply to Horsforth. The obligations of Yeadon were such as to preclude this; and it must be remembered that the population of that place was increasing, and would be doing so during the four or five years that would be required to carry out the works proposed. The condition of the Horsforth water was good, and the supply was fairly satisfactory. Other witnesses expressed the opinion that the supply to the town had been fairly satisfactory.

Mr. Fitzgerald then addressed the Committee in opposition to the Bill. He contended that no charge of mismanagement had been brought against the Company—at any rate, since 1885. Under these circumstances, there was no case for purchase. It was said the Company were willing sellers. They were, if they could get fair terms. But it was not fair to ask them, after two years of frost and drought, and when they were doing their best to meet their obligations, to sell on the terms they could get now. In conclusion, he urged that the necessity for the transfer of the works to the District Council had not been proved. Mr. Ram, on the other hand, contended that the report of Dr. Bruce Low alone condemned the supply of the Company, and maintained and contended that the mismanagement had been fully proved.

The consideration of the Water Company's Bill was then proceeded with; the case for the promoters being opened by Mr. Pember. He detailed the proposals of the Company, who first obtained parliamentary powers in 1865. These were extended in 1885. The Company proposed to acquire the upper and lower Lanshaw dams, near Burley, of the capacity of 10 million gallons, and make a new reservoir on Burley Moor, with a capacity of 50 million gallons. They would also impound the waters on the moorland to the extent of 100 acres, and 50 acres in the Burley and 50 in the Ilkley district. The works would only be six or seven miles from Horsforth, which would meet the objection that the Company were going beyond their own watershed, though the old idea that a company should be confined to their own watershed had been exploded since the Duke of Richmond's Commission. Turning to the Bill of the Burley District Council, that body proposed to construct a reservoir at Carr Bottom, and to impound the Carr Beck and Colston Beck. They proposed also to buy the two dams which the promoters wished to purchase, and to raise new capital to the amount of £12,000. Mr. Johnson, their Engineer, estimated the present supply at 117,400 gallons per day; and taking the population of Horsforth at 7700, there would be a supply of 15 gallons per head daily for all purposes. This was rather a tight fit, so that extension was necessary. The present works of the Company were fully utilized. The new scheme would supply 149,000 gallons of water per day; and the estimated cost would be £20,000. The learned Counsel urged that the acquisition of the works they proposed would not affect Burley at all. They contended that if Burley wanted more gathering-ground they could get 400 acres to the north of the Horsforth Company's proposed area, and adjoining their present ground.

The fourth day of the inquiry opened with evidence by Mr. Charles Gott, who expressed the opinion that the Company were the right people to carry out the new works. The gathering-ground of Mr. Johnson's

scheme was a good one, and such as he himself would have selected. He knew no other place to which Horsforth could go. In his opinion, the Burley Council had no special claim to the water area they had chosen; and he thought they would not use it if they had it. Burley was a small place, and its population had only increased 100 in ten years. The Council were in a peculiar position. They came to Parliament in 1873, and obtained power to take the water from the 1400 acres to the north of the moor; but they had never exercised their powers, though they owned part of the land proposed for the reservoir. There was more water in that area than Burley could use; and it was the easiest for them to get. In his opinion, if the Horsforth Council got their Bill, they would be in a very unfortunate position. They would find a short supply of water, with no means of meeting the deficiency, and no arrangements for supplying the wants of the neighbourhood. Mr. W. Gill, the owner of bleach works on the Carr Beck, said he was satisfied with the compensation water provided for in the Company's Bill. They gave 74,000 gallons a day, while the Burley Bill only provided for 18,600 gallons. Mr. T. Fairley, Analyst for Leeds and the North Riding of Yorkshire, proved that the water on the area proposed was of good quality.

The case for the Company then closed. After a short consultation, the Chairman announced that the Committee had decided to pass the preamble of the Horsforth District Council's Bill. Mr. Balfour Browne thereupon asked for the rejection of the Company's Bill. Mr. Pember said, in view of the utility to the district of the Company's proposals, he must ask the Committee to hear the case to its completion. They felt that without their Bill the Company could not be in a position to fulfil their statutory obligations. Mr. Balfour Browne, in reply, said he did not know why his friends wished to keep their Bill alive. They thought the best means of supplying the district was by the plan they proposed. But the Council would certainly not carry out those works, which they considered both unsuitable and expensive. They intended to pump the water that was under their feet; and they did not wish to be saddled with any new works of the Company. If not dead, the Company were moribund. If their Bill were thrown out, the Company would only be able to get from the Council the prospective value of their undertaking for the three years during which their agreement with Yeadon was running; but if the Committee passed the Bill, the prospective value would be enormously increased. He strongly urged the Committee not to give the Company the increased powers they sought. Without consulting, the Chairman said they would in this matter reserve their decision till they had heard the Burley case. This was then proceeded with.

Mr. Worsley Taylor intimated that it would be convenient to submit his evidence first. He therefore called Mr. Alfred Pattison, who stated that in October last he was called in to advise Burley as to the extension of their water supply. He found that the present works were in many respects unsatisfactory. The reservoir was placed at too low a level, and the supplies were polluted. In 1893 the supply failed, though the year was not an exceptionally dry one. In his opinion, it was best for Burley to take the Carr Beck area for the source of its supply—indeed, this was the only area he could recommend. It was also the only place on which he could construct a reservoir embankment. In his opinion, the site suggested for them by the Horsforth Company was fissured, and quite unsuitable. The reservoir he proposed would be at a level of 890 feet above the sea, and its capacity would be 15½ million gallons. Besides this, they proposed to take the upper and lower Lanshaw dams, the capacity of which he estimated at 6½ millions. These reservoirs would give them a 200 days' supply of 156,325 gallons, or deducting 18,600 gallons for compensation water, 137,725 gallons. Adding their present 50,000 gallons, these new works would give them a daily supply of 187,725 gallons. At the rate of 26 gallons per head, this would furnish a daily supply for 7222. The area proposed was all in their own district.

The Chairman here announced that, before any further evidence was taken on the Burley Bill, they would hear Mr. Pember on behalf of the Water Company. The learned Counsel, however, said he saw what was obviously in the minds of the Committee, and considered it was unnecessary for him to address them. The Chairman then said the Committee had unanimously decided that the preamble of the Company's Bill had not been proved, but that the preamble of the Horsforth District Council's Bill was proved. They expressed the opinion that Burley needed an increased supply of water; and the only question was between the landowner (Mrs. Crofton) and the District Council as to the area to be acquired. Mr. Williams, who represented this lady, said that if the Committee were of the opinion that Burley needed a further gathering-ground, Mrs. Crofton was willing, as far as her estate was concerned, to fall in with the wishes of the District Council; but he asked the Committee to protect her interests, and to do as little injury to her property as possible. Mr. Worsley Taylor and Mr. Williams then discussed the position of Mrs. Crofton and her rights and requirements in connection with her land, from which the promoters desired to take water.

The Committee gave Counsel time to confer in private, and meanwhile adjusted the clauses of the Horsforth District Council's Bill. The consultation did not result in any agreement between Counsel, who continued their arguments before the Committee. A further consultation took place, after which Mr. Williams suggested that the difficulty could be met by a clause binding the Council to use the streams and springs belonging to Mrs. Crofton; but the Committee unanimously rejected the suggestion. They then passed the Burley Bill, adjusted clauses, and ordered this and the Horsforth Bill to be reported.

The Quality of London Water last Month.—Reporting upon the quality of the London Water Supply during the past month, Sir William Crookes and Professor Dewar say: "The chief characteristic of the Metropolitan Water Supply has been its exceptional microbic purity. While in February the raw Thames water contained over 23,000 microbes per cubic centimetre, yielding filtered water containing an average of 54 microbes, the unfiltered Thames in March contained an average of 12,000 microbes, and the filtered water 28 microbes per cubic centimetre. The improvement in the River Lea is equally marked. In February, the unfiltered Lea showed an average of 7481 microbes, reduced by filtration to 68; while during March the average number of microbes in the Lea, unfiltered and filtered, have been respectively 5977 and 33. This marked improvement in the river waters is certainly connected with the deficient rainfall of the past month."

MISCELLANEOUS NEWS.

RIVER PLATE GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Thursday, at Winchester House, Old Broad Street, E.C.—Mr. A. E. Bowen in the chair.

The Secretary (Mr. Ernest Heald) having read the notice convening the meeting, the report and accounts, to which reference was made last week, were taken as read.

The Chairman, in moving their adoption, said the Board were pleased to be able to put before the shareholders what they hoped would be considered a satisfactory statement of the Company's affairs. The Directors were particularly satisfied with the result of the year's work, because they were directly responsible for advising the shareholders to agree to the amalgamation of the two old Companies. On the debit side of the profit and loss account was the debenture interest £9702, as against £12,301 in 1897—the difference being one of the economies of the amalgamation. The net revenue for the year was the handsome sum of £107,956, against £80,352 in the preceding year; and this large amount was arrived at after making liberal provision for any doubtful outstandings. The shareholders he thought would agree with him that the Board had not starved the Company's property, when he mentioned that out of revenue no less than £21,029 had been spent in keeping up the works and the network of mains, &c., to the highest possible degree of efficiency. Never in the history of either of the amalgamated Companies had the works been in the admirable state they were now in. Although they had carbonized 485½ tons of coal less than in 1897, they had obtained an additional yield of 6,273,000 cubic feet of gas. It was the efficient state of the works which had helped them to such good results; and therefore he did not think the shareholders would grudge the money spent in this way. The capital expenditure during the year had been £26,985, as compared with £29,186 in 1897. The Board were perfectly satisfied that this outlay was absolutely necessary, and likely to give good results. It included the cost of 15,870 lineal metres of new mains, or (say) nearly 10 miles. The Company had now 333 miles of mains in Buenos Ayres. They had really laid 29,719 metres of new mains; but as they took up 13,849 metres from streets in which the old Companies had duplicate pipes, they only took credit for the net extension of 15,870 metres. Improvements had also been made in the way of enlargements in the distribution system. The capital expenditure further included the cost of installing a complete set of charging and drawing machinery at Corrales, which was giving splendid results. They had also commenced to manufacture their own meters, which were formerly imported from England and France, as they found they could make them for a great deal less than the imported ones cost. There was no getting away from this capital expenditure. The city was spreading at a great rate; and in order not to be left out in the cold, they must push ahead with their mains, and be first in new districts. During the year, 4660 new meters had been fixed; but, for one reason or another, they had removed some 3000—leaving a net gain of rather more than 1600. The Company had now above 22,700 customers; and, in addition, they supplied upwards of 5800 street-lamps. They were gradually working up a good business in supplying gas-engines, and were now endeavouring to introduce cooking and heating by gas. The Welsbach light had not given them all the results they expected from it. But considerable impetus had been given to it by an exhibition of lighting by this method; and the Directors hoped they would obtain many new customers in consequence. As the accounts showed, the electric light had not so far hurt them very much; and it was his conviction that it would not do so. During last year, the three Electric Light Companies in Buenos Ayres only took 36 customers away from them. He referred to the energy shown by the Local Committee in connection with the Company's business, and mentioned incidentally that, though they had a very large account with the Municipality for street lighting, they had nothing whatever outstanding with them at the end of the year. As to the distribution of the profits, a further £20,000 had been passed to the reserve fund, making it £40,000; and £10,000 had been placed to a special contingency fund. An interim dividend of 6s. per share was paid on Oct. 17 last; and the Directors recommended a balance dividend of 8s. per share, free of income-tax—making 7 per cent. for the year.

Mr. C. P. Ogilvie seconded the motion; and, after a short discussion, in which general satisfaction with the Company's position was expressed, it was unanimously carried.

The dividend having been declared, the retiring Directors (Messrs. H. G. Anderson and A. T. Hooper) and the Auditors were re-elected.

Due acknowledgment of the services of the Chairman and Directors, and of the Local Committee and officials concluded the proceedings.

THE BOLTON CORPORATION TAR TENDERS.

The question as to the acceptance of tenders for the tar made at the gas-works of the Bolton Corporation during the ensuing twelve months still occupies a good deal of public attention; and from all accounts there is sure to be another discussion on the subject at the next meeting of the Council. The action of the Gas Committee in dividing the make of tar (less 10 per cent. reserved for local firms) between Messrs. Turner and Co., of Queen's Ferry, and the Burnden Tar Company, of Bolton, is much criticized in some quarters; and, as far as can be gathered, those in opposition incline to the opinion that the local firm named should have had the whole of the tar, although their tender was 1d. per ton less than that of the Welsh firm. They point out that, in the case of Messrs. Turner, the Corporation will have to pay for haulage; while in the case of the Burnden Tar Company they do their own—a circumstance which brings the price of the local firm to a better level than that of Messrs. Turner. A further point is that the Burnden Tar Company having had the whole of the tar from the gas-works, have been in a position to supply the Corporation with pitch at 23s. a ton; but they cannot do so now. They wrote to the Streets Committee to that effect; and tenders were invited for

the supply of pitch by that body. The Burnden Tar Company raised their price to 26s. per ton; and the result is that the contract has gone to Messrs. Horrocks and Co., of Manchester, who offered to supply at £1 5s. 6d. per ton. This means that the Committee will have to pay 2s. 6d. a ton more for pitch than would have been the case if the tar had remained in Bolton; and as about 2000 tons will be required, the extra cost is £250. The Gas Committee, it is urged, only get a few extra pounds by accepting the tar tender of an outside firm (to be accurate £13 6s. 8d., without haulage cost); while another department has to pay £250 more by their action. These are only a few of the arguments raised; and more will be heard at the meeting of the Town Council on May 3.

LEEDS CORPORATION GAS UNDERTAKING.

The Half-Year's Accounts.

The revenue account of the Leeds Corporation gas undertaking for the six months ending Dec. 31 reveals a healthy condition of things; and the figures have come out even better than was anticipated by the management. The profits, after paying interest on capital, amount to £23,670. Out of this £8613 has been set apart for the redemption of the debt on the undertaking; leaving a surplus profit of £15,056, as compared with £2000 for the corresponding period of 1897. The difference between the returns for the two comparative half years is £13,056, so that both the Gas Committee and the ratepayers have every reason for satisfaction. A number of causes have combined to bring about such a gratifying financial result. Thanks to the Chairman, Alderman Lowden, the Committee enjoyed during the second half of 1898 a great advantage over many other gas undertakings in not having to pay any advance on the previous year's coal prices. Side by side with this favourable circumstance, they had an unusually large demand for residuals at enhanced rates; resulting in a substantial addition to the receipts. So great was the winter demand for coke, that the Committee were able to dispose of the whole of this residual without any stacking. Incidentally, it may be mentioned that the present price of coke, for which there is still a good demand, is 9s. 2d. per ton; a further advance of 10d. having taken place so recently as Friday last. The total income from all sources for the half year was £173,203; the sale of gas alone representing in the gross £144,165. This sum may be regarded as a record one; the competition of electricity having been more than met by the use of prepayment meters and cooking and heating stoves. Then, owing to the new installation of stoking machinery at the Meadow Lane and New Wortley works, gas was in the six months under notice, and is still being, produced at a much less cost than formerly, besides which the output per ton of coal carbonized was much greater than in previous years. The present surplus does not establish a record. For the half year ended Dec. 31, 1895, the surplus profit amounted to £17,756; but it should be borne in mind that during that period the price of gas was 4d. per 1000 cubic feet more than in 1898 (equal to an annual sum of £40,000), and that a further income of between £11,000 and £12,000 was then derived from meter-rents, which have been abolished. The Corporation financial year ends on March 25; and the returns for the past three months, it is stated, will be on quite as satisfactory a basis as those for the second half of 1898.

ELECTRIC LIGHTING NOTES.

Messrs. Crompton and Co. have received a cablegram from Calcutta announcing that the supply of electrical energy for lighting and power has been commenced in the city. This is the first occasion of the supply of electricity from a central generating station in India.

The Dudley Corporation have applied to the Local Government Board for their sanction to the borrowing of £8500 for the provision of electric light works; and Mr. H. Percy Boulnois held an inquiry into the matter last Friday. It was stated that £7500 was required for the building and equipment of the works, and £1000 for the purchase of the site.

The electric light purchase question at Woking received its death-blow at last Wednesday's meeting of the District Council, when the Clerk reported the receipt of a resolution passed at a parish meeting in favour of purchase, on the understanding that "any profit made should go to, or loss incurred should fall upon, the Station and Maybury ward." The Vice-Chairman (Mr. Sawyer) moved the suspension of the Standing Orders, in order that the matter—upon which the Council at their last meeting passed a resolution by the casting-vote of the Chairman refusing to treat for the undertaking—might be re-opened, and again discussed. After a conversation, the motion was rejected by eight votes to five.

The Electricity Committee of the Manchester Corporation met last Tuesday to consider the estimates for the current year. The assumed income, chiefly from sales of current, is £82,500. After meeting all expenditure, it is anticipated that there will be a surplus balance of £8115. To this will be added £2000 from last year's account, making a total disposable balance for the year of £10,115, of which £10,000 will be paid to the City Fund. In the year just closed, there was an actual profit of £16,754, out of which £12,000 was paid to the City Fund; the remainder being held over. The estimated expenditure on capital account for the year is £203,400; £86,200 being for mains. For street lighting there is an estimate of £2000, receivable from the City Fund.

Last Thursday a Local Government Board inquiry was held at Huddersfield relative to the application of the Corporation for power to borrow £50,000 for electric lighting purposes. The Town Clerk (Mr. F. C. Lloyd) mentioned that the balance of loans authorized to be raised for the borough was £88,815—all in respect of electric lighting. Alderman Calvert, the Chairman of the Electric Light Committee, referred to the rapid increase in the number of consumers. The Committee had had recently to decline a number of applications, because they had not the necessary plant, and no further money to spend. The profit on the undertaking during the year 1898 was £2437; the whole of which was transferred to the depreciation and contingency fund. By the proposed extension 16,000 additional lamps of 8-candle power can be supplied.

In 1893, the Bootle Corporation first considered the question of adopting a system of electric lighting; but it was only twelve months since that they first took steps to obtain authority to borrow the money required—£35,000—to carry out the scheme. The works have since been completed; and their formal inauguration took place last Thursday. The capacity of the plant is 300 kilowatts, which is capable of serving about 8000 8-candle power lamps. For the public lighting of the borough, 72 arc lamps have been provided; each lamp-post being fitted with two brackets for incandescent lamps, arranged so that at midnight the arc lamps may be switched off and the incandescents on. It has been decided that in the first instance 7d. per unit for the first hour at maximum demand be charged, and that all energy used in excess of this amount be charged at the rate of 3d. per unit. At the present time, the works are supplying about 2000 incandescent lamps and 52 arc lights.

At a special meeting of the Bangor City Council last Wednesday, the Mayor (Alderman J. E. Roberts) presiding, the minutes of a special meeting of the Lighting Committee were submitted by Alderman Grey Edwards, who moved their adoption. The Committee recommended that, in lieu of the guarantee, which had caused so much discussion, the signed agreement and verbal promises to take electrical energy from the Corporation to the extent of nearly 60,000 units, should be accepted, that works be erected, that the report of the Engineer (Mr. F. Hastings Medhurst) be adopted, and that the tenders amounting to £13,052 be approved. Dr. Price seconded the motion. Mr. T. J. Williams moved, as an amendment, that the recommendations of the Committee be not accepted at the present time, but that the Board of Trade be asked to extend the time-limit prescribed by the Provisional Order. The recommendation of the Committee was, he said, inimical to the financial interests of the town, and would lead to the throwing away of a monopoly which had cost £50,000. Mr. Owen seconded the amendment. After a prolonged discussion, the recommendations of the Committee were adopted by a large majority.

PROPOSED PURCHASE OF THE EXMOUTH WATER-WORKS.

The question of the purchase of the undertaking of the Water Company was again under the consideration of the Exmouth District Council last Wednesday. Some correspondence with Mr. Mansergh as to his terms for making a valuation of the works was read. Mr. Abell moved that the terms be accepted, and the valuation proceeded with. If the Council could purchase the water-works at a fair price, he considered that it would be a great acquisition to the town. Mr. Tupman pointed out that this was the third time the proposal to purchase the works had been taken up by the Council. On previous occasions they had reached a certain stage, and then the matter had fallen through. In answer to a question, the Clerk read a letter in which the Directors of the Company assented to the request of the Council for permission for the Council's Engineer to inspect the works. Mr. Bray thought they ought to proceed with the matter at once. If they put off the purchase for ten years, they would probably have to give three times as much for the works. Mr. Pimm suggested that, as the Company would benefit by the sale of the works, they might be prepared to pay part of the Engineer's fee. Mr. Abell said it was not to be expected that they would do so. The Company had invited the Council to make them an offer; and as the Council were not in possession of sufficient data to enable them to do this, they proposed to call in an expert. Under these circumstances, they could not ask the Company to pay a share of the costs. The resolution to proceed with the matter was carried by nine votes to one.

PROPOSED JOINT WATER BOARD FOR BURY DISTRICT.

At Special Meetings recently held of the Haslingden Corporation, the Radcliffe, Ramsbottom, Whitefield, and Little Lever District Councils, and the Bury Rural District Council, the seals of these respective Authorities were affixed to an agreement for the constitution of a Joint Board for the acquisition and control of the water-works undertaking of the Bury Corporation, as from March 31, 1900. Provision has been made for the inclusion of Rawtenstall, though the Corporation are not parties to the agreement. The document sets forth that the name of the new Board will be the Bury and District Joint Water Board. The meetings are to be held at the Water-Works Offices, Bury, unless other premises are found. For the first five years the Chairman is to be appointed from among the representatives of the Bury Corporation, and the Deputy-Chairman from among those of the other Authorities; and, after the expiration of that period, the Chairman and Deputy-Chairman can be selected from among the whole body of members. The Bury Corporation have undertaken to promote a Bill for the constitution of the Joint Board and the acquisition of the water-works undertaking, with the exception of the Chesham reservoir, which forms part of the Clarence Recreation Ground. The annuities, mortgages, &c., properly chargeable to the undertaking or the revenue are to continue to be charged, as if the transfer had not been made; and, as an additional security, such annuities, mortgages, &c., are to be chargeable to the rates and funds of the constituent Authorities, and not, as now, exclusively to the rates of the Bury Corporation. The consideration for the purchase is to be the money paid by the Bury Corporation to the sinking fund account, and to make up the deficiency on the revenue account. The amount is to be ascertained by calculating the sum paid by Bury since 1872 to the credit of the water-works undertaking by means of a public water-rate, less the amount properly chargeable to that rate for the supply of water for better security against fire and for sanitary purposes within the borough of Bury; the amount contributed since 1872 to the undertaking out of the Bury general rate; together with interest at 3 per cent. per annum from the time the payments or contributions were made. Any deficiency in the revenue is to be apportioned between the constituent Authorities, on the basis, practically, of revenue paid for water supplied for domestic purposes to the different districts. The agreement also includes provisions relating to the distribution of any surplus that might be made, the taking over of the existing staff of officers, and other clauses. The agreement is, of course, subject to the approval of Parliament.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The "Glasgow Herald" of to-day publishes the following information regarding proceedings in London this week: "The members and officials of the Glasgow Corporation, who are at present in London in connection with the Corporation Gas and Water Bill, succeeded during yesterday in bringing to a satisfactory conclusion their negotiations with the Directors of the Caledonian Railway Company in reference to the opposition of the latter to the Bill. It will be remembered that a few days ago the Select Committee of the House of Lords postponed consideration of the Bill, as there was a prospect of a settlement being arrived at. This settlement being now reached, the Bill will, as soon as the necessary scheduled agreement has been approved by Lord Morley, be withdrawn from the group in which it now stands, and be referred to the Unopposed Bills Committee. The great objection of the Caledonian Railway Company to the Bill was that the North British Railway Company, in addition to themselves, were to have a connection with the new gas-works of the Corporation at Blochairn. At present the lines of the Caledonian intersect the eastern portion of the ground to be acquired for the gas-works, and they also run along the northern side of the ground. The Corporation wished also to have a connection with the lines of the North British Railway Company, whose tracks are at present distant about 1000 yards from the west side of the proposed works. This was the more desirable from the fact that the Glasgow and South-Western Railway Company have running powers over the North British line; so that by having the second connection the Corporation would be able to get coal direct from all the coal-producing districts of Scotland. The matter was of some importance, because, when the new gas-works are completed, the quantity of coal and other material which will have to be taken in and out of the works will be about 6000 tons per day. The new works will produce 40 million cubic feet of gas daily; while the three present gas-works of the Corporation can only turn out 35 million cubic feet a day among them. In order to admit of the formation on an easy gradient of a connection with the North British Railway, the Corporation proposed to take a piece of land belonging to the Caledonian; but the latter Company strongly objected, and said they would not on any account sell to the Corporation any ground which was to be utilized for such a purpose. The Corporation met this by altering their plans so as to render it unnecessary to take any portion of the Caledonian Company's land for the connection with the North British; and so sidings from both railways into the works were assured. The Caledonian Company yesterday gave their assent to proposals by the Corporation for the formation of bridges over the Caledonian lines and the Monkland Canal for carrying roads of access into the new gas-works. Part of the arrangement is that the Corporation convey to the Caledonian Company certain pieces of land for the future widening of the Company's existing line of railway; the price to be settled by agreement, or, failing that, by arbitration." All parties being thus satisfied, the erection of the new gas-works is assured.

The Treasurer (Mr. Fleming) reported to a meeting of the Glasgow Finance Sub-Committee on the 29th ult., that the gas receipts for the current year showed an increase of almost £23,000 over the income for the corresponding period of last year. At that date they amounted to £342,905, as compared with £319,968; thus showing a net increase of £22,937. The income for residuals sold up to Feb. 28 was considerably less; but there was an increase of upwards of £6000 more than for gas-rental. For this year there was received the sum of £119,020, against £89,726 at the corresponding date last year. These totals show that there was an increase in the receipts for this year of £29,294.

The Glasgow Corporation gas-workers are being prodded on by agitating non-workers in their movement for higher wages, holidays, and the like. A "mass meeting" of the workers was held on Wednesday night in the Albion Hall, at which the chair was taken by Councillor Cronin, and addresses were delivered by Messrs. W. Thorne, R. C. Robertson, of Glasgow, and others. The increase of wages asked is 6d. per day; but the leading point in the agitation, I apprehend, is that which is directed against the requirement to sign on for six months. It is also asked that ratepayers should get preference in the matter of employment, and that there should be equality of work and wages in the three gas-works owned by the Corporation. A branch of the National Union of Gas-Workers and Labourers in General of Great Britain and Ireland, has been formed by the Committee who were appointed at a previous meeting; and the men at this meeting pledged themselves to join it. A resolution was also unanimously adopted, that the Town Council be memorialized to grant the concessions asked. Now, whatever the Corporation may do in other matters, they cannot afford to let the men have their way in reference to signing on. The employment of ratepayers is an illustration of the perfection to which class agitators can bring a policy of cruelty against the defenceless. A man might be unable, through sickness, or other cause, to pay his rates for one year; and, according to this policy, he would be refused work under the Corporation. It is, besides, an altogether unreasonable and useless request, because whenever a man gets employment in a gas-works he forthwith becomes a resident in the neighbourhood, and expends his wages there, which is all that a full-fledged ratepayer does. As to equality of work and wages in the three gas-works, this is an impossibility, on account (if for nothing else) of diversity of structure. The workers themselves know it to be so; and it may be taken as an indication that they did not frame the memorial in which this is asked. The movement is of the ready-made order, which those who live by such things are prepared to furnish anywhere, on the shortest notice, with or without request, as circumstances or necessities call for it.

The Assessor of Canals and Railways has fixed the valuation of the undertaking of the Stirling Gas Company at £2347. The valuation last year was £1700; but the Burgh Assessor raised it to £2685. The Corporation sustained the Assessor's valuation; and the Company, as a means of escape from what they regarded as an inequitable burden, required the Assessor of Canals and Railways to fix the valuation. This gentleman reduced the Burgh Assessor's valuation by £338. The Police Commissioners might have appealed to the Sheriff against the reduced valuation, but they did not; and it is now final. The valuation, I understand, is not for the current year, which still stands at £2685, but is for the year from Whitsunday next.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1035.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½*	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½*	..	4 10 11
300,000	100	Jan. 3	5	Australian 5 p. c. Deb.	104—106	..	4 14 4
200,000	5	Nov. 11	6	Bombay, Ltd.	6⅞—7¼	..	4 2 9
40,000	5	,,	6	Do. New, £4 paid	4⅞—5¼	..	4 11 5
380,000	Stk.	Feb. 24	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New	213—218	..	4 2 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb.	128—133	..	3 0 2
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig.	265—270	..	4 5 2
226,890	,,	,,	8½	Do. A. Ord. Stk.	194—197	..	4 6 4
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	47—49	..	4 1 8
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	20—22	..	4 1 10
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	11—11½	..	5 4 4
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.	103—105	..	3 16 2
150,000	20	Mar. 10	8½	Cagliari, Ltd.	38—39	..	5 13 10
100,000	10	Sept. 29	7	Cape Town & Dis., Ltd.	14—15	..	4 13 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	57—59	..	5 1 8
550,000	Stk.	Apl. 13	13½	Commercial Old Stock	310—315*	..	4 5 9
200,750	,,	,,	10½	Do. New do.	240—245*	..	4 5 9
200,750	,,	Dec. 15	4½	Do. 4½ p.c. Deb.	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	203—208	..	4 16 2
200,000	,,	,,	7	Do. 7 p. c. Pref.	187—192	..	3 12 11
51,600	Stk	Feb. 24	14	Croydon A 10 p. c.	305—310	..	4 10 4
168,400	,,	,,	11	Do. B 7 p. c.	255—265	..	4 3 0
655,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p c.	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd.	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4⅞	Gas-light and Coke ⟨ 4 p. c. Ord.	115—117	−1	4 3 9
2,900,000	,,	,,	3½	⟨ 3½ p. c. max.	101—103	..	3 8 0
3,799,735	,,	,,	4	⟨ 4 p. c. Con. Pref.	127—130	+½	3 1 7
3,843,975	,,	—	—	⟨ 3 p. c. Con. Deb.	101—103	..	—
70,000	10	Nov. 11	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	,,	10	Imperial Continental	225—230	+2	4 6 11
376,400	100	Feb. 1	4	Do. 4 p. c. Deb. Red.	98—101	..	3 19 3
473,600	Stk.	Feb. 10	5½	Do. 5½ p. c. Deb. ,,	102—105	..	3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd.	5—5½	..	5 9 1
560,000	100	Apl. 4	5	Met. of ⟨ 5 p. c. Deb.	111—113	..	4 8 6
250,000	100	,,	4½	Melbourne ⟨ 4½ p. c. Deb.	110—112	+5	4 0 4
541,920	20	Nov. 11	5	Monte Video, Ltd.	15½—16½	..	6 1 3
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.	228—233	..	3 19 5
264,855	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb.	107—110	..	3 3 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd.	7½—7⅝	..	5 3 3
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6⅝	..	5 6 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1⅝	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd.	4½—5½	..	6 13 4
500,000	100	Dec. 1	6	People's Gas of Chicago ⟨ 2nd Mtg. Bonds	102—106	..	5 13 2
848,070	10	Oct. 13	7†	River Plate Ord.	12—12½	+½	5 12 0
250,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.	103—105	..	3 16 2
250,000	10	Mar. 29	10	San Paulo, Ltd.	16—17	−½	5 17 8
135,000	Stk.	Mar. 29	10	Sheffield A.	237—240	..	4 3 4
209,053	,,	,,	10	Do. B.	237—240	..	4 3 4
447,427	,,	,,	10	Do. C.	237—240	..	4 3 4
5,600,000	Stk.	Feb. 10	5⅓	South Metrop., 4 p.c. Ord.	140—143	..	3 14 7
1,460,000	,,	Jan. 13	3	Do. 3 p. c. Deb.	101—103	..	2 18 3
—	—	—	—	Tottenham and Edmonton ⟨ A.	—	..	—
—	—	—	—	⟨ B.	—	..	—
182,380	10	Dec. 30	5	Tuscan, Ltd.	9½—10½	..	4 15 3
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.	99—101	..	4 19 0
				WATER COMPANIES.			
746,184	Stk.	Dec. 30	11	Chelsea, Ord.	318—323	..	3 8 1
150,000	,,	,,	5	Do. 5 p. c. Pref.	168—173	..	2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	150—155	..	2 18 1
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.	155—160	..	2 16 3
1,730,560	Stk.	Apl. 13	7	East London, Ord.	217—220*	..	3 3 2
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb.	156—159	..	2 16 7
390,000	,,	,,	3	Do. 3 p. c. Deb.	102—104	..	2 17 8
700,000	50	Dec. 15	7½	Grand Junction ⟨ 10 p. c. max.	172—115	..	3 5 5
310,000	Stk.	Mar. 29	4	⟨ 4 p. c. Deb.	125—140	..	2 17 2
708,000	Stk.	Feb. 10	14	Kent	855—860	−2	3 17 9
160,000	,,	,,	7	Do. New, 7 p. c. max.	210—215	..	3 5 1
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max.	298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p. c. max.	230—235	..	3 8 1
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.	135—140	..	2 17 2
500,000	100	Feb. 11	13½	New River, New Shares	433—438	..	3 2 9
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb.	137—142	..	2 16 8
902,300	Stk.	June 29	7½	South-wark and Vauxhall ⟨ Ord.	205—209	+1½	3 11 9
126,500	100	,,	7½	⟨ 7½ p. c. max.	192—196	..	3 16 6
489,200	Stk.	,,	5	⟨ 5 p. c. Pref.	168—171	..	2 18 6
1,019,585	,,	Apl. 13	4	⟨ 4 p. c. A Deb.	135—140*	..	2 17 2
1,155,066	Stk.	Dec. 15	10	West Middlesex	300—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	159—162	..	2 15 7
200,000	,,	Mar. 10	5	Do. 5 p. c. Deb.	101—103	..	2 18 3
				* Ex div.			

† Next dividend will be at this rate.

The Helensburgh Police Commissioners, who are to become the owners of the local gas-works on the 15th prox., held a special meeting on Tuesday to consider various matters relating to the undertaking. The Gas Committee reported that the storage accommodation was less than half the maximum daily output of gas; and, on their recommendation, the Commission resolved to proceed with the erection of a new gasholder of 200,000 cubic feet capacity. There is not sufficient space within the gas-works to admit of a new holder; and application is to be made to Sir J. Colquhoun for 2 acres of ground at the east-end of South King Street, to be used for gas-works and other purposes.

Sir John Cheyne, in his capacity of Sheriff of the County of Renfrew, held an inquiry in the Paisley Sheriff Court on Wednesday, under a petition by the Corporation of Paisley asking authority to their borrowing £25,000 for the extension of the gas-works. The petition was presented under the Paisley Gas Acts of 1870 and 1845. Objection was taken to the proposal on behalf of some members of the Corporation, whose contention was that, under the statutes, any money required for extensions or improvements of the gas-works should be derived from profits, which were amply sufficient for the provision of all that may be necessary. They also pointed out that the Corporation had just obtained power to borrow £60,000 for the introduction of electric lighting; and they argued that this money could not be expended without reducing the consumption of gas in the burgh. The Town Clerk explained the proposals of the Corporation, which include the formation of a sinking fund for the repayment of the money. Evidence in support of the petition was given by Bailies Wilson and Smith, and Mr. G. R. Hislop, the Gas Engineer. For the objectors, ex-Provost Clark and ex-Bailie Andrews were examined. The Sheriff said he thought it was a pity that the Town Council had not deferred the application for two or three years, so as to see what effect the introduction of the electric light would have on the gas consumption. He would, however, consider the application, and make his report to the Secretary for Scotland. Sheriff Cheyne's remark calls for this comment—that his suggestion of two or three years' delay, if it should be followed, would have the effect of giving the electric light a start to which it is not entitled. The best way to deal justly between the two lights, is to give them both ample facilities for their promotion. It is also the best assurance there is of cheap production. The starving of any department does not lead to economical working. To refuse the powers asked would be to assume a belief on the part of the Sheriff that the money might be altogether lost, which is untenable. But surely the Sheriff should have no difficulty in granting the borrowing powers. The evidence in support would consist of specific statements, taken from authoritative documents; that in objection must, of necessity, have been little else than sentiment, or unfounded apprehension of coming decay—a *rôle* there are always plenty of nervous people prepared to play.

A somewhat singular accident occurred at the Dumfries Corporation Gas-Works at 2 o'clock on Tuesday morning. The workmen on duty were startled by a loud crash, somewhat resembling a peal of thunder; and, on examination, they found that a water-tank had burst. About two years ago, on complaint by the owners of a brewery that their water supply was being contaminated by discharges or leakages from the gas-works, the Corporation sank an artesian well to a depth of 600 feet, from which they now supply both the brewery and the gas-works. In the gas-works they erected this tank 12 feet above the ground, resting upon cast-iron pillars, which, in turn, were supported by a brick basement. The tank was 30 ft. by 10 ft. by 8 ft. It is not known what caused it to give way. The entire side was forced out; fragments of it being thrown as far as 10 feet. No further damage was done. The metal plates of which the sides of the tank are composed, are $\frac{5}{8}$ inch in thickness. It is matter of calculation whether this was sufficient; but, of course, everything would depend upon how the structure was braced. The weight of water in the tank would be about 60 tons; and the lateral pressure would be equal to more than 50 tons.

The Forfar Gas Corporation held a prolonged meeting on Monday, which was almost wholly devoted to the consideration of the proposal of the Gas Committee to erect a new gasholder of 150,000 cubic feet capacity. At present the storage accommodation is only equal to about half the maximum daily output of gas—a state of matters which is not to be thought of without a feeling of anxiety. The Gas Committee had procured estimates from five firms who build gasholders—three in Scotland, and two in England—and these showed that the cost would probably be about £3000. There was some cavilling at this step, which I think was justified; for it is not business to ask people to put themselves to the trouble to send in an estimate for work which it has not yet been resolved to have done. It was the case, however, that they obtained the information which they desired; and it was laid before the meeting. Ultimately the proposal of the Gas Committee was carried; and the Committee met on Wednesday night to make arrangements for proceeding with the work. Then a requisition, signed by 25 ratepayers, was produced by Provost M'Dougall, asking him to call a meeting of citizens to consider the decision of the Corporation. It was reported that a reply had been sent to the promoters of the requisition, to the effect that the Gas Corporation having resolved upon the construction of a new gasholder, a meeting would not be called. Mr. Waddell submitted plans for the new holder, and then, out of deference to an expression to the effect that an expert might be called in, it was decided to submit the plans and specifications to Mr. Alex. Smith, of Aberdeen, for his opinion. The Committee also resolved to proceed with the construction of the tank and concrete work.

The Greenock Police Board had before them on Tuesday a subject which I have never seen raised before—the granting of allowances to the widows of employees. Three widows had made application. It was explained that the Board had been in the habit of making such allowances, but that the Clerk had given his opinion that the practice was illegal. The husband of one of the applicants was 41 years at the gas-works, and was for a time foreman. The Board generally expressed regret that they should not have power to make the grants which were asked; and they sent the subject back to the Committee to try to discover if there were some way of acting generously towards the applicants.

In the Glasgow Town Council on Thursday, it fell to Bailie Carsewell, in the absence of Mr. Osborne, the Convener of the Water Committee, and on account of the sudden death of Mr. Guthrie, the Vice-Convener,

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to submit the recommendations of the Committee with reference to the water-rates. He said that last year they made substantial reductions in the charges for warehouses, offices, shops, &c., and also extended the privilege of the meter system; the reductions amounting in the aggregate to about £6000 per annum. This year it was proposed to make the privilege of the meter system universal to all traders and business premises, if wanted; to reduce the domestic rate within the city from 6d. to 5d. per pound; and, in order to encourage trade, they proposed to reduce the price of water supplied by meter from 33s. 4d. to 30s. per 100,000 gallons, and for pumped water from £3 6s. 8d. to £3 per 100,000 gallons. These reductions involved a diminution in revenue of fully £18,000 per annum. Bailie W. F. Anderson acknowledged the very handsome report presented by the Water Committee, which, after allowing for a reduction of £18,000—equivalent to 1d. in the pound—was left with a credit balance of £44,000. The Committee's recommendations were adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 22.

Sulphate of Ammonia.—The hardening tendency referred to in last report has continued throughout the week; and the market closes very firm at £10 17s. 6d. to £11 per ton, delivered f.o.b. at the ports. Consumers, who were misled by recent "bear" quotations, having now realized the actual situation, have come forward freely at the advanced prices, for immediate and for early delivery. They have also bought for first half of May at a small discount on spot prices. The best demand, it may be observed, has been for non-nitrate consuming countries. Supplies have been very scarce; and speculators who deferred their buying are finding it difficult to cover their month's requirements. There has also been large buying (speculative) in the forward position in Scotland for various periods of delivery, up to March next, at prices ranging from £10 10s. to £10 17s. 6d. f.o.b. Leith, according to time of delivery.

Nitrate of Soda is barely steady at 8s. 3d. per cwt. for fine quality on spot.

LONDON, *April* 22.

Tar Products.—With the exception of creosote and pitch, which are in moderate demand, this market is as dull as it can well be. The over-production of benzol seriously prevents any possible advance in any form of that product; while the low price obtaining for it is reflecting itself on naphthas, which are marked weaker. Very low prices are being accepted for anthracene, large parcels of which are occasionally forced on the market. A good deal of comment is being made on the absurd price which has been bid for a certain tar contract in Lancashire. It is stated that the price offered, at the present market price of products, will leave the buyer a certain loss of 7s. 6d. per ton. The tar, however, is of rich quality; and its value can in no sense be measured by the tars produced in other parts of the country, which have a very different composition.

To-day's values are: Tar, 14s. 6d. to 20s. 6d. Pitch, east coast, 26s. 6d.; west coast, 24s. 6d. Benzols, 90's, 7d.; 50's, 7¾d. Toluol, 10d. Solvent naphtha, 1s. Heavy naphtha, 1s. Crude, 30 per cent., naphtha, 3d. Creosote, 3½d. Heavy oils, 57s. 6d. Carbolic acid, 60's, 2s.; 75's, 2s. 7d. Creosote salts, 45s. Anthracene, nominal, "A," 4½d.; "B," 3½d.

Sulphate of Ammonia.—An improved tone has come over sulphate. Buyers will now pay £11, less 3¼ per cent. both for prompt and for May delivery, while for the latter half of the year, a less margin is quoted. Nitrate is quoted stronger; and its value is undoubtedly being influenced by the higher prices of sulphate.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position throughout the coal trade of this district remains practically without any very material change. The better qualities suitable for house-fire purposes are still in fairly active demand; collieries being able to move away all their output without difficulty, and stocks being exceptionally low for the season of the year. There is every probability of prices being exceedingly firm all through the summer; and that pits may also possibly be kept on full time. At the pit prices remain strong at 12s. to 12s. 6d. per ton for best Wigan Arley, 10s. 6d. to 11s. for Pemberton four-feet and seconds Arley, and 9s. 6d. to 10s. for common house coal. With regard to gas coals, there is nothing new to add to what was reported last week, as contracts are not yet coming forward; but during the ensuing month there will be tolerably large business on the market, which will afford a fairly accurate test of the strength of prices, with respect to the general advance of 1s. 6d. per ton that collieries have decided to hold out for. All descriptions of fuel, for iron-making, steam, and general manufacturing purposes continue in very brisk demand, with, if anything, a shortness of supplies; and though perhaps slack is a trifle more plentiful in some quarters, generally there are still no surplus quantities offering on the market, and new business continues difficult to place. Prices are firm, with a tendency to harden at some of the Lancashire collieries; and an upward move is talked of in districts where rates are scarcely yet on the full level of Lancashire. Good qualities of steam and forge coals are fetching about 9s. per ton; and slack is very firm at 5s. 3d. to 5s. 6d. for common, 5s. 9d. to 6s. for medium, and 6s. 6d. to 6s. 9d. for best sorts. For coke prices are strong. The shipping trade is fairly active, with common round coals quoted at 9s. 6d. to 9s. 9d. per ton at the Garston Docks, about 10s. at the High Level, Liverpool, and 10s. 3d. to 10s. 6d. at the Partington tips on the Manchester Ship Canal.

Northern Coal Trade.—The coal trade is very brisk, and prices are higher through the scarcity of several classes of coals, and through the growing local demand. Best Northumbrian steam coals are scarce, and command about 12s. 6d. per ton f.o.b.; second class steam are about 11s. 9d., and steam smalls from 6s. 6d. to 6s. 9d. Manufacturing coals are steady in price and in good demand. In gas coals, it is believed that more of the large contracts for the South have been placed, and that at prices substantially above those of the past year; but the exact figures have not yet transpired. For occasional cargoes, the quotation for best Durham

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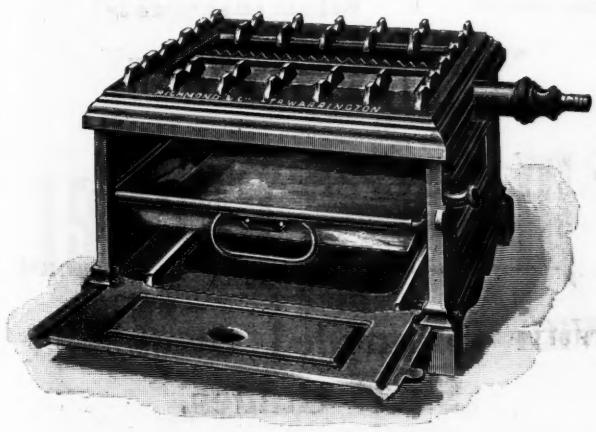

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gas coals varies from about 8s. 6d. per ton f.o.b. up to 9s. 3d., according to the quality and the extent of the production of the special collieries that may be contracted for. Gas coke shares in the improvement; but much of the output is sold on contract. Prices have not generally varied for gas coke this week.

Scotch Coal Trade.—There is little change to chronicle. The demand continues good, and prices have a tendency towards greater firmness. Foreign trade is not, however, expanding as it was expected to do. The prices quoted are: Main 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. and 10s., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 159,085 tons—a decrease of 2919 tons upon the previous week, and of 64,589 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,113,432 tons—an increase upon the same period of last year of 24,684 tons.

Gas Explosion in Victoria Street.—A serious explosion of gas occurred on the premises of Messrs. Symons and Co., in Victoria Street, Westminster, just before nine o'clock last Tuesday evening. According to a statement made by the proprietor, the gas had been for some time escaping into the top room of the house; and when this was filled, it became ignited at the jets—a violent explosion following. The roof of the room was blown off, and serious damage was done to the walls, glass, and furniture. The housekeeper was sitting in the room at the time, and received injuries to the face and head which necessitated her removal to Westminster Hospital. Several passers-by were struck by falling bricks, slates, and glass.

Sales of Shares.—Messrs. Penny and Clark submitted to public auction last Tuesday 300 new £5 shares in the Havant Gas Company; and the prices obtained varied between £6 12s. 6d. and £6 17s. 6d. At Torquay on Wednesday, 205 shares of £10 each in the Torquay Gas Company were offered for sale. Shares bearing dividends at the rate of 10 per cent. realized from £23 17s. 6d. to £24, and 7 per cent. shares from £16 7s. 6d. to £17 per share. At Plymouth, £2000 worth of additional shares in Plymouth Gas Company produced £24 2s. 6d. per share. A quantity of £10 10s., fully paid-up shares in the Abingdon Gas Company lately yielded from £11 5s. to £12 2s. 6d. per share. At a sale of shares at Dorking, some excellent prices have been realized. Fully paid-up "A" shares of £25 each in the Dorking Gas Company sold at £56, and some at £53 10s. each; the latter price being also obtained for class "B" shares. Twenty ordinary £10 fully paid-up shares in the Dorking Water Company were also sold at £18 10s. and £18 each. Fully paid £5 shares in the Redhill Gas Company fetched from £11 to £11 15s. each. A few £5 shares in the Portsmouth Water Company were sold at Southsea last Tuesday at £14 and £13 17s. 6d. each; on the same occasion, two lots of £50 of consolidated ordinary stock in the Gosport Water Company produced £125 each, and £50 of new ordinary stock £90. At other sales, £100 of ordinary consolidated stock in the Isle of Thanet Gas Company has been disposed of at £140; and some £5 shares in the Chatham, Rochester, &c., Water Company, at £15 3s. 6d. and £15 2s. 6d. each.

A Town Lighted by Water Gas.—At Pettau, in Styria, new water-gas works have recently been opened by the Municipality for the supply of the town. The plant is on Dr. Strache's latest system.

Suggested Transfer of the Pretoria Water-Works to the Government.—In the money article of "The Times" last Saturday it was reported that earlier in the week, at a meeting held in Pretoria, Mr. A. D. W. Wolmarans (formerly Raad member for the district of Pretoria) stated that the Government had decided upon the terms to be offered to the shareholders of the Pretoria Water-Works Company for the purchase of their interests in the concession. The Government proposed to buy the whole concern for about £137,000, which would include material and interest at the rate of 8 per cent. upon the total amount of dividends paid to the shareholders.

The Northam Water Undertaking.—The scheme of water-works of the Northam District Council for the supply of a large area in North Devon which is without a proper water system is well in hand. A huge puddle trench about 1000 feet in length is in course of formation for an impounding reservoir. The site is a most suitable one for the purpose; being naturally formed in the centre of a great water-bearing and collecting district, with a stream running through the valley. The reservoir when full will contain 33 million gallons of water, which, after passing through filter-beds, will be taken by means of a 6-inch pipe to a second reservoir to be built at Northam, eight miles distant. The water will be distributed to Appledore, Westward Ho, and all outlying parts of Northam.

Kingsbridge Water Supply.—Finding it impossible to either comply with the onerous conditions laid down by the Local Government Board or to induce the Board to relax them, the Kingsbridge Urban District Council have decided to abandon their application for a Provisional Order for the acquisition of land for a new water supply. A meeting of the Council was held last Wednesday, when the reply to the Council's remonstrance against the conditions laid down was read. In their letter, the Council pointed out that to purchase the large extent of farming land, and let it run to waste as was suggested, would impose upon the town financial burdens which it was quite unable to bear. The Local Government Board replied that, taking into consideration all the surroundings and the risk run from probable pollution through drainage of the farmyard and the manure on the land, their consent could not be given to the adoption of the scheme. The Chairman (Mr. J. S. Hurrell) said the matter had been fully explained to the Local Government Board. It was simply impossible for the Council to undertake what was required of them. The Surveyor added that he had seen Mr. E. Sandeman, the Engineer of the Plymouth Water-Works, who was consulted in reference to the scheme for the supply of Kingsbridge. Mr. Sandeman told him he could not understand the attitude taken by the Local Government Board; and it was the first he had heard of such stipulations. The new reservoir for the supply of Plymouth was surrounded by cultivated land, which was manured in the usual way. It was decided to pay the Engineer's fees and other expenses of the scheme, and to call a special meeting of the Council for the further consideration of the question.

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SEVERAL COLOURS OF ENAMELLED LININGS.

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NEW SEASON'S LIST NOW READY.

New Capital for Gas-Stoves at Llandudno.—The Llandudno District Council have resolved to apply to the Local Government Board for sanction to borrow £5000 for the purchase of gas-stoves for hiring.

Workington and Cockermouth Water Supply.—An agreement has been arrived at between the Corporation of Workington and the Cockermouth Urban and Rural Councils with reference to the Workington Water Bill, which is to enable the Corporation to construct additional works, purchase the undertaking of the Cockermouth and Workington Joint Water Committee, and raise the necessary capital. Surplus water is to be supplied to the Cockermouth Rural District Council at 1¾d., and to the Cockermouth Urban District Council at 1½d. per 1000 gallons. The new works are to be completed by Dec. 3, 1902.

The Eccup Reservoir of the Leeds Corporation.—The protracted and costly operations undertaken by the Leeds Corporation to put a stop to the leakages in the great storage reservoir at Eccup have, it is believed, fully achieved their object. Some eighteen months have elapsed since they were completed; but it would have been unwise to declare the result then. It was necessary that the new work should have time to settle. Meanwhile the reservoir has been slowly filling, and careful observations have been made. These, according to the "Leeds Mercury," have been quite satisfactory; no leakage having been revealed. The capacity of the reservoir is 1331 million gallons, and its depth 62 feet. At present there is 42 feet of water in it, or about 900 million gallons. The result is regarded as a great engineering triumph.

Fylde Water-Works Company.—The half-yearly report of the Directors of this Company (adopted by the meeting of shareholders at Blackpool last Thursday) stated that the expenditure on capital account during the last six months was £23,014, and the account now stands at £469,954. This amount includes £96,340 paid towards the new works authorized by the Fylde Water Act, 1896. The water-rates and the other receipts during the half year ending Feb. 28, after an allowance of £449 for empty houses, &c., and bad debts, amounted to £20,094; the interest on loans and bank commission, to £1782; and the working expenses, rents, rates, and taxes, to £4309—leaving a balance of £14,003. To this was added the amount brought forward, £19,765; making a total of £33,768. The Directors recommended a dividend at the rate of 4 per cent. per annum on the preference stock, 1891, at the rate of 10 per cent. per annum on the "A" stock, and at the rate of 7 per cent. per annum on the "B" stock, all less income-tax; leaving a balance of £23,594 to be carried to the next account. The net profits of the past year amounted to £28,151, after paying interest on the cost of the new 24-inch main to Blackpool, which is nearly completed. As the maximum dividends only amount to £20,348, there is a surplus profit of £7803, of which a considerable portion would be available in reduction of the water charges had no transfer of the works taken place.

The receipts of the Thames Conservancy last year in respect of the Upper Navigation amounted to £34,077, of which £26,755 was contributed by the London Water Companies.

The Workington Corporation have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a new reciprocating exhauster, annular condensers, and tower scrubber.

West's Gas Improvement Company, Limited, have recently received orders for installations of their stoking machinery for the Harrogate, Folkestone, Ashford, and Walker Gas-Works; and for an extension of their system at the West Bromwich Gas-Works.

Messrs. James Milne and Son, Limited, have received instructions to proceed with station-meters with bye-pass valves and connections for the Paisley and West Hartlepool Gas-Works; the former of 150,000 cubic feet and the latter of 100,000 cubic feet capacity per hour.

Messrs. Kirkham, Hulett, and Chandler, Limited, have recently received orders for two patent "Standard" washer-scrubbers, each for 3 million cubic feet of gas per day, for erection at the Saltley station of the Birmingham Corporation; two machines, each for 2½ millions, for the Sculcoates works of the British Gaslight Company; and one for 1 million for the Peterborough Gas Company.

At the Mart, Tokenhouse Yard, to-morrow, Mr. Alfred Richards will sell, by order of the Directors, shares and stock of the Aldershot Gas and Water Company and of the Crays and Worthing Gas Companies; as well as preferential debenture and ordinary stock of the Brighton and Hove Gas Company, shares and debentures of the West Ham Gas Company, and some "B" shares in the Ilford Gas Company, by instructions of trustees and others.

A very successful series of practical cookery demonstrations has been given at West Bromwich by Messrs. W. Parkinson and Co. during the past week, in order to show what can be done with gas-grillers among the working classes. A large number of orders were taken for prepayment meters and grillers as the result of the demonstrations. All the arrangements for the demonstrations were carried out under the superintendence of Mr. W. H. Wayte, the Gas-Fittings Superintendent of the Borough Gas Department.

It is reported that Messrs. James Milne and Son, Limited, of Edinburgh, are about to dissolve the present Company in order to register a new Company under the same title but having a larger capital, which is to consist solely of £10 5 per cent. cumulative preference shares and ordinary shares. Only the former are to be offered to the public. Since the Company was registered in 1892 the London house business has been acquired from Messrs. Milne, Sons, and Macfie, and the branch house, including gas-meter works, established in Leeds.

The following exhibitions of gas appliances have lately been held: By Messrs. Fletcher, Russell, and Co., Limited, at Bedminster and Great Yarmouth, with lectures by Miss Helen Edden; by Messrs. R. & A. Main, Limited, at Trafford Road and Pendleton (Salford), Blackpool, Edinburgh, and Peterhead, with lectures by Miss Taylor, Miss Bennett, Miss Baines, Miss Griggs, and Miss S. Y. Young; by Messrs. Richmond and Co., Limited, at Bury, Langley Mill, Blackpool, Morley, Malvern Link, Stockport, and Bodmin, with lectures by Miss M. Smallwood, Miss Barker, Mrs. I. Bradshaw, Miss L. Richmond, and Miss A. B. Beeton.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

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BLACKBURN	1,250,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000

AND ADDITIONAL WORK.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

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Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see April 4, p. 883.]

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BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
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Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
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REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

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BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

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Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

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TRAVELLERS who are continually calling at Gas-Works are invited to communicate with Advertiser, who wishes to make arrangements with them to purchase Gas Retort Carbon on commission.
Apply, by letter, to No. 3246, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Working Manager (aged 40) a Situation in small Gas-Works making from 3 to 5 Millions. 27 years' Experience in the Manufacture and Distribution of Coal Gas from the Retort to the Burner, including Index Taking, Main and Service Laying, House Fitting, the Setting of Retorts, &c. Good References.
Apply, by letter, to No. 3255, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, by a practical Working MANAGER, the Management of a Gas-Works where the Annual make of Gas is from 15 Millions upwards. Has had practical Experience in the Construction, Erection, and Maintenance of Gas-Works, and the Manufacture and Distribution of Gas in all its branches. A change desired. Excellent References and Testimonials.
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REQUIRED, a responsible Situation by Advertiser (aged 28), with long practical experience of the Trade. Thoroughly capable of estimating and carrying out all classes of work. Good References.
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WANTED, a thoroughly competent CHIEF CLERK, not under 30, fully capable and qualified to undertake the responsibility of the whole of the Books of the Company, inclusive of the preparation of the Statutory Balance-Sheets.
Apply, not later than May 2, enclosing *copies* of three recent Testimonials, to the SECRETARY, 55, Chapel Road, WORTHING.

SEASON 1899.

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CYCLES of the Highest Quality at reasonable Prices. Catalogue, post free. For CASH, or on GRADUAL PAYMENT SYSTEM. *Sent on approval. Twelve Months' Guarantee.*
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Apply for Particulars to J. FRYER, Manager, Gas-Works, MARKET HARBOROUGH.

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Apply to the MANAGER, Gas-Works, Kingsbridge, DEVON.

DRAUGHTSMAN wanted. One accustomed to detailing Gas Apparatus preferred.
Apply, stating Age, Experience, and Salary required to R. DEMPSTER AND SONS, LIMITED, Elland, YORKS.

WANTED, two Carbonizing Foremen.
Must have a knowledge of Regenerator Furnaces and Machinery.
Apply, stating Age, Experience, and Wages required, with *copies* of two Testimonials as to character, to the MANAGER, Gas-Works, PETERBOROUGH.
April 13, 1899.

WANTED, at once, a steady and reliable young Man as TIMEKEEPER and GENERAL CLERK in a Gas and Water Manager's Office. Must have had some previous experience, write a good hand, and be correct at figures.
Further Particulars as to Duties, &c., can be obtained from the MANAGER, Gas-Works, Bexhill, SUSSEX.

WANTED, a Junior Clerk. Must be efficient in Shorthand, and have had experience in Gas and Water Office.
Applications, in own Handwriting, with not more than Three Testimonials, to be sent to my Office not later than the 26th of April. Salary £50 per annum.
By order,
REGINALD W. EDWARDS,
Secretary.
Gas and Water Offices,
Aldersh't.

SHIPLEY GASLIGHT COMPANY.

WANTED, a Clerk, with good general knowledge of Gas Manufacture and Chemistry Must be able to app'y the usual Tests required on a Gas-Works.
Applications (with *copies* of recent Testimonials), stating Age and Salary required, to be sent in to the undersigned.
T. G. WILCOCK,
Secretary and Manager.
Gas-Works, Shipley, Yorks.,
April 21, 1899.

LONGTON CORPORATION GAS-WORKS.

THE Gas Committee invite applications for the post of MANAGER of their Gas-Works. The person appointed will have the control and management of the Works; but the whole of the clerical work in connection with the Department will be undertaken by the Secretary and Office Staff. The Engagement will be subject to Three Months' Notice to terminate the same at any time. The Manager will be required to devote the whole of his time to the discharge of the duties of his Office, and to provide a Guarantee, in an approved Guarantee Society, in the sum of £500 for faithful services. Preference will be given to anyone having a knowledge of the management of a Joint Gas and Electric Light Undertaking.
Salary £250 per annum.
Canvassing strictly prohibited.
Applications, endorsed "Gas Manager," stating Age, Experience, present Employment, &c., accompanied by *copies* of not more than three recent Testimonials, to be sent in to the undersigned on or before the 11th day of May, 1899.
GEO. C. KENT,
Town Clerk.
Town Clerk's Office, Court House,
Longton, April 14. 1899.

LONGTON CORPORATION GAS-WORKS.

THE Gas Committee invite applications for the post of SECRETARY and CASHIER of their Gas-Works. The person appointed will have to devote the whole of his time to the discharge of the duties of his Office, and will be responsible for the management and superintendence of the whole of the Office staff in connection with the Department. He will be required to provide a guarantee in an approved Guarantee Society in the sum of £500 for faithful services.
Salary £150 per annum.
Canvassing strictly prohibited.
Applications, endorsed "Gas Secretary and Cashier," stating Age, Experience, and present Employment, accompanied by *copies* of not more than three recent Testimonials, to be sent in to the undersigned on or before the 11th day of May, 1899.
GEO. C. KENT,
Town Clerk.
Town Clerk's Office, Court House,
Longton, April 14, 1899.

WANTED, a Yard Foreman for Gas and Chemical Works. One accustomed to Retort-House Work preferred.
Apply, by letter, to No. 3252, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Clerk wanted at once for a medium-sized Gas-Works in Scotland. Salary £1 per week. This is a good opening for a young Man with a knowledge of Drawing.
Apply, by letter, to No. 3251, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two Carbonizing Foremen, accustomed to Regenerative Furnaces and Inclined Retorts.
Apply, by letter, enclosing *copies* of three recent Testimonials as to Character and Abilities, to No. 3227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THERE is a Vacancy in the Office of the Bromley Gas Consumers' Company for a CLERK. Must be well educated, and have had suitable experience. Age not under 20 years. Salary to commence, £78 per annum.
Apply, stating Particulars, to the Secretary, Mr. H. W. AMOS, Gas-Works, Bromley, KENT.

THE Dronfield Gaslight and Coke Com- pany are in want of a second-hand METER TEST HOLDER, in good condition.
For further Particulars, apply to the Manager, Mr. THOMAS B. JONES.

WANTED, immediately, two 12 feet Square PURIFIERS in good condition, with Seives complete. Also 20,000 Cubic Feet ENGINE and EXHAUSTER.
Apply, by letter, to No. 3244, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF WOKINGHAM.

WANTED, a Set of three or four second- hand PURIFIERS, 10 or 12 feet square, with Lifting Gear complete. Must be in good condition.
Price and full Particulars to the MANAGER AND SECRETARY, Gas Office, Wokingham, BERKS.

CONDENSERS WANTED.

WANTED, a good set of second-hand ANNULAR or VERTICAL PIPE CONDENSERS, suitable for a Gas-Works making from 20 to 30 Million cubic feet of Gas per annum.
State, by letter, Price, with full Particulars, to No. 3254, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A small high class Gas- EXHAUSTER, with Engine combined. Perfectly new. Others in progress.
SELLERS PICKERING AND Co., Gas Engineers, Ravensthorpe, YORKS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS Plant for Sale, as fixed at Kintbury, Berks. GASHOLDER, 1000 cubic feet, complete, and in good order. One DRUM WATER-METER, with Valves and Governors complete. One pair of Lime PURIFIERS, 5 ft. by 2 ft. 4 in. sections complete. Four RETORTS, 9 feet by 11 inches diameter, with Ascension-Pipes, &c., complete.
Apply to Mr. CLARKE, The Gardens, Inglewood, Kintbury, BERKS.

FOR SALE, cheap—
Two PURIFIERS, 8 ft. square by 4 ft. deep.
Two " 5 ft. " 4 ft. "
One " 5 ft. " 3 ft. "
One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " " "
Also CONDENSERS, SCRUBBERS, WASHERS, GASHOLDERS and TANKS, VALVES, &c., &c.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

IMPROVED WATER-METER.

VALUABLE PATENT RIGHTS FOR SALE.

MESSRS. CRUIKSHANK AND FAIR- WEATHER, 62, St. Vincent Street, Glasgow, are open to treat for the SALE of HALLBERG'S BRITISH PATENT No. 5119/98, and also the corresponding GERMAN, AUSTRIAN, and UNITED STATES PATENTS.

FOR SALE, at the Hednesford Gas- Works, Staffs., the following Second-hand Plant:—
Oval MOUTHPIECES, with Lids complete, 18 in. by 21 in. and 15 in. by 18 in.
ASCENSION, H, and DIP PIPES, 6 inch.
HYDRAULIC MAINS, 24 in. by 24 in. and 18 in. by 18 in.
Set of 6-inch CONDENSERS.
ENGINE and EXHAUSTER, 5000 cubic feet per hour.
LIVESEY WASHER, with 8-inch Connections.
TOWER SCRUBBER, 8 ft. 6 in. diameter, and 15 ft. high, with 6-inch Connections.
Two PURIFIERS, 12 ft. by 12 ft. by 4 ft. 6 in., with Lifting Gear, and 6-inch Valves and Connections.
One Round STATION METER, to pass 6000 cubic feet per hour
For further Particulars, apply to the MANAGER, Gas-Works, Cannock, STAFFS,

FOR SALE—A Village Gas-Works com- plete. A Working Manager with moderate Capital would find in this a good Investment and comfortable Home.
Address No. 3243, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Urban District Council of Atherton invite OFFERS for the following surplus PLANT, which may be inspected at their Gas-Works:—
One 12-inch Braddock's STATION GOVERNOR, with Valves and Connecting-Pipes.
One 8-inch Cast-Iron VERTICAL PIPE CONDENSER, with Bottom Box, complete.
Tenders to be addressed to
D. SCHOFIELD,
Clerk.

HOLSWORTHY, DEVONSHIRE.

GAS-WORKS, Freehold, to be Sold with immediate possession. Entirely new (by Willey and Co.), and in Perfect Condition. Consumers, about 80. Gas make, over two millions.
A prosperous going concern in one of the most thriving Railway (L. & S.W.) and Market Towns in the County; and an unusual opportunity for a Working Manager. Part Purchase Money may remain.
Application to be made to the HON. SECRETARY.

URBAN DISTRICT COUNCIL OF BUXTON.

CONTRACT FOR TAR AND LIQUOR.

THE Urban District Council invite TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Works in Ashwood Dale, during One or more Years.
Particulars to be obtained of Mr. Geo. Smedley, Gas Department, Town Hall, Buxton.
The Council do not guarantee to accept the highest or any Tender.
Tenders, endorsed "Tender for Tar, &c.," to be addressed to the Chairman of the Gas Committee, and sent in not later than noon, on the 29th of April next.
By order,
JOSIAH TAYLOR,
Clerk to the Council.
Buxton, April 12, 1899.

TENDERS FOR COAL.

THE Urban District Council of Buxton invite TENDERS for the supply of about 4000 Tons of COAL per annum for One or more Years, to be delivered at their Siding on the Midland Railway in Ashwood Dale, Buxton.
Tenders, endorsed "Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, not later than Noon on the 29th of April.
Forms of Tender and Particulars may be obtained of Mr. Geo. Smedley, Engineer, Gas Office, Town Hall, Buxton.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
JOSIAH TAYLOR,
Clerk.
Buxton, April 12, 1899.

FIRE-CLAY GOODS.

THE Urban District Council of Buxton invite TENDERS for the supply of FIRE-CLAY RETORTS, QUARRIES, BRICKS, and CLAY.
Forms of Tender and Particulars may be obtained of Mr. Geo. Smedley, Gas Office, Town Hall, Buxton.
Tenders, endorsed "Tender for Retorts, &c.," addressed to the Chairman of the Gas Committee, to be forwarded not later than noon, on the 29th of April.
By order,
JOSIAH TAYLOR,
Clerk.
Town Hall, Buxton,
April 12, 1899.

CORPORATION OF NOTTINGHAM.
(GAS DEPARTMENT.)

TENDERS FOR COALS.

THE Gas Committee are desirous to receive OFFERS for supplies of COALS, COBBLES, or NUTS, for the period terminating the 30th of June, 1900.
The large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by and at the expense of the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.
The Coals, Cobbles, or Nuts are to be the best of their respective kinds, freshly wrought and well screened (Description, Sizes, and Inclination of Screen to be specified), to be as free as possible from Sulphur, Bats, Bind, Refuse and Dirt, and shall be weighed (20 Cwt. to the Ton) upon the Corporation Machines or upon such other Machines as may be mutually agreed upon.
Payments will be made monthly, if and so long as the Contract shall be duly fulfilled.
The Corporation do not bind themselves to accept the lowest or any Tender.
Further Information and Forms on which the Tenders must be made, may be obtained on application to me, at the General Manager's Office; and the Tenders (sealed) specifying the description of Coals, the Seam, and the Pits at which they are to be raised, and stating the Prices for deliveries at the several places and in manner and subject to the conditions aforesaid, must be delivered to Sir Samuel George Johnson, Kt., Town Clerk, on or before Saturday, the 6th day of May, 1899.
By order,
WILLIAM REGINALD CHESTER,
Engineer and General Manager.
Corporation Gas Offices, George Street,
Nottingham, April 24, 1899.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the supply of 3500 Tons of Screened GAS COAL, BURGY or WASHED NUTS, and 250 Tons of CANNEL or CANNEL NUTS.
Specification and Form of Tender may be obtained from the undersigned.
Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, on or before Wednesday, the 3rd of May.
WM. ORME,
Manager.
Gas-Works, Congleton.

BOROUGH OF CONGLETON.

TAR AND LIQUOR.

THE Gas Committee invite Tenders for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Gas-Works during the period from the 1st of July, 1899, to the 30th of June, 1900.
Particulars may be obtained from the undersigned.
Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, on or before Wednesday, the 3rd of May.
WM. ORME,
Manager.
Gas-Works, Congleton.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1100 to 1300 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Railway Station, at such times and in such quantities as may be required, prior to the 31st of May, 1900.
Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.
Sealed Tenders, on the form provided for the purpose (with the Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 6th of May.
The Corporation do not bind themselves to accept the lowest or any Tender.
S. JOHN TOMBS,
Town Clerk.
Droitwich, April 20, 1899.

SHEFFIELD UNITED GASLIGHT COMPANY.

COKE-HOPPERS.

TO ENGINEERS, IRONFOUNDERS, AND CONTRACTORS.

THE Directors of this Company invite TENDERS for the supply, delivery, and erection of 30 COKE-HOPPERS for Retort-House at their Grimesthorpe Station.
Copy of the Drawing, with Specification and Form of Tender, may be obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d. (not returnable).
Sealed Tenders, endorsed "Tender for Coke-Hoppers," must be delivered by post at the Company's Offices not later than the first post on Saturday, the 29th day of April.
The Directors do not bind themselves to accept the lowest or any Tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
April 15, 1899.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO ENGINEERS, IRONFOUNDERS, &c.

THE Directors of this Company invite TENDERS for the supply and erection of a CAST-IRON TANK for Water and Liquor, 39 ft. 4 in. by 27 ft. 6 in. by 5 ft. 6 in. deep, together with Girders, Ladder, Landings, &c., at their Grimesthorpe Chemical Works.
Drawings may be seen and Specification, with Bill of Quantities, obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Water and Liquor Tank," must be delivered by post to the undersigned at the Company's Offices not later than the first post on Saturday, April 29.
The Directors do not bind themselves to accept the lowest or any Tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
April 13, 1899.

BOROUGH OF PETONE, NEW ZEALAND.

TO GAS ENGINEERS, MANUFACTURERS, AND CONTRACTORS.

THE Petone Borough Council invite TENDERS for the supply and delivery at the Port of Wellington, New Zealand, of the undermentioned Plant and Apparatus for the Manufacture and Distribution of Coal Gas—viz., RETORT-HOUSE IRONWORK and FIRE-CLAY GOODS, EXHAUSTER, CONDENSER, SCRUBBER, TWO PURIFIERS, STATION METER, 40 feet GASHOLDER, STATION GOVERNOR, 6-inch, 4-inch, and 3-inch Cast-Iron Spigot and Faucet MAIN PIPES, Wrought-Iron TUBES and FITTINGS, LAMP-POSTS, TOOLS, and SUNDRIES.
Plans, Specifications, and Tender Forms may be inspected at the Office of the "JOURNAL," 11, Bolt Court, Fleet Street, London, E.C.
Tenders, sealed and endorsed "Tender for Gas Plant," will be received at the Office of the Borough Council, Petone, Wellington, New Zealand, until Friday, the 30th day of June, 1899.
The Council do not bind themselves to accept the lowest or any Tender, and may accept the whole or any part of a Tender as they may see fit.
R. CLEMENT KIRK,
Mayor.
Petone, March 15, 1899.

KEIGHLEY CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the supply of 470 yards of 12-inch SOCKET PIPES.

Particulars can be obtained on application to the undersigned, to whom Tenders must be sent on or before Monday, the 1st of May next, endorsed "Tender for 12-inch Pipes."

By order,
JOHN LAYCOCK,
Engineer and Manager.

April 21, 1899.

TENDERS FOR GAS COAL.

THE Directors of the Cheltenham Gas-light and Coke Company are prepared to receive TENDERS for the supply of COAL during a period of Twelve Months from the 1st of July next.

Particulars may be obtained from the undersigned, to whom Tenders, endorsed "Tender for Coal," must be delivered on or before Thursday, the 18th of May next.

R. O. PATERSON,
Engineer.

Gas-Works, Cheltenham,
April 21, 1899.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive TENDERS for the supply of from 2000 to 3000 Tons of GAS COAL, to be delivered free to the Watermoor Station of the Midland and South-Western Junction Railway Company during the ensuing Twelve Months in such quantities as may be ordered by the Manager.

Tenders, marked "Tender for Gas Coal," to be sent to the undersigned not later than May 2.

J. P. BEECHAM,
Secretary.

Gas Offices: 12, Silver Street,
Cirencester, April 12, 1899.

THE Westerham Gas and Coke Company, Limited, invite TENDERS for the supply and setting of a BED of FIVE BEST STOURBRIDGE FIRE-CLAY RETORTS, with the necessary Bricks, Fire-Clay, &c.

Specifications may be had on application to the undersigned.

Endorsed Tenders to be sent in by the 3rd of May.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
CHAS. HOOKER.
Secretary and Manager.

Westerham, Kent.

CANTERBURY GAS AND WATER COMPANY.

TENDERS FOR GAS COALS.

TENDERS are invited for the supply of 14,000 Tons of the best NEWCASTLE GAS COALS, to be delivered during One Year commencing on the 1st of June next.

Forms of Tender containing Particulars and Conditions of the Contract may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Coals," to be delivered at the Company's Offices, Castle Street, Canterbury, on or before Saturday, the 13th of May next.

By order,
JAMES BURCH,
Secretary.

April 18, 1899.

TAR AND AMMONIACAL LIQUOR.

THE Accrington District Gas and Water Board are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR, which may be produced at the Accrington and Great Harwood Works of the Board, during the Year from the 1st of July next to the 30th of June, 1900.

Estimated total quantity of Tar 1900 Tons, Liquor 5000 Tons.

Tenders, endorsed "Tar and Ammoniacal Liquor," must be in my hands on or before Tuesday, the 9th of May.

By order,
CHAS. HARRISON,
General Manager.

General Offices of the Board,
Accrington, April 22, 1899.

SHIPLEY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shipley Gaslight Company invite TENDERS for the supply of 1000 Tons to 6000 Tons of best screened GAS COAL, to be delivered into their Works, by the Leeds and Liverpool Canal, during the Twelve Months ending June 30, 1900.

Tenders to be sent in to the undersigned not later than May 6, 1899.

The Directors do not bind themselves to accept the lowest or any Tender.

T. G. WILCOCK,
Manager.

Gas-Works, Shipley, Yorks.,
April 24, 1899.

SKIPTON GAS COMPANY.

THE Directors of this Company are pre-pared to receive TENDERS for the supply of 7000 Tons of best screened GAS COAL, to be delivered as may be required during Twelve Months ending June 30, 1900.

Quotations to specify Price per ton, free on rails at Skipton, or delivered into the Company's Coal-Shed alongside the Canal.

Tenders, endorsed "Coal," to be sent to me not later than May 9 next.

No Forms of Tender issued.

The Directors will not be bound to accept the lowest or any Tender.

J. HAIGH,
Secretary.

April 13, 1899.

TO COLLIERY PROPRIETORS.

THE Directors of the Barnstaple Gas Company invite TENDERS for the supply of 3000 Tons of the very best GAS COALS, to be delivered as to 2000 Tons by the 1st of October next, and as to 1000 Tons by the end of December following. To be delivered at Framington Quay or at Barnstaple Station.

Tenders by the 1st of May next.

RICHARD ASHTON,
Secretary and Manager.

April 10, 1899.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the supply of GAS COAL for their Works during the Year ending June 30, 1900.

Forms of Tender and any other Particulars may be had on application to the Manager, Mr. S. S. Mellor.

Tenders, endorsed "Coal," and addressed to the Chairman, must be delivered here not later than Friday, May 5, 1899.

H. PICKERING,
Secretary.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee are prepared to receive TENDERS for the supply of about 110,000 Tons of COAL and CANNEL required by them during the Year ending the 30th of June, 1900.

Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, the 9th of May.

A. NICHOLSON,
Town Clerk.

April 20, 1899.

COAL CONTRACT.

THE Directors of the Ossett Gas Company invite TENDERS for the supply of 8000 Tons of GAS COAL between the 1st of July, 1899, and the 30th of June, 1900, at such times and in such quantities as the Company's Manager may direct.

The quality of the Coal must be good, dry, free from Sulphur, Bats, Bind, Refuse, and Dirt.

Tenders, stating Price per ton, delivered free at the Gas-Works, Ossett, to be sent in not later than Tuesday, the 9th of May, 1899.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
WALTER HORSWELL,
Secretary.

Gas-Works, Ossett,
April 20, 1899.

BOROUGH OF NEWBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the Newbury Corporation invite TENDERS for the supply of 3300 Tons of best GAS COAL and 200 Tons of good class CANNEL during the period of Twelve Months between July 1 next and the 30th of June, 1900, to be delivered free to Newbury Station on the G.W. Railway in such quantities as may be agreed.

Tenders to be endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Newbury, and delivered not later than the 5th of May next.

The Committee do not bind themselves to accept the lowest or any Tender.

WM. R. DAVEY,
Manager.

Gas-Works, Newbury,
April 20, 1899.

ALTRINCHAM GAS COMPANY.

COAL AND CANNEL CONTRACTS.

TENDERS are invited for best Gas Coal and CANNEL for One or Two Years from the 1st of July next. Estimated quantities required each year: Coal 9000 Tons, Cannel 4000 Tons. Deliveries to be free at Altrincham Railway Station as required.

Sealed Tenders, endorsed "Tender for Coal and Cannel," stating the description of both, whether screened or unscreened, the Pits from which they are to be raised, the amount proposed to be supplied, and cash terms for monthly payments, to be sent, addressed to the undersigned, so as to be received not later than Twelve o'clock noon on Tuesday, the 9th day of May next.

The Directors do not bind themselves to accept the lowest or any Tender; but the person or persons whose Tender may be accepted will be required to execute an agreement for the due performance thereof.

No special Form of Tender is required.

F. R. B. LINDSELL,
Secretary.

Gas Offices, Moss Lane,
Altrincham, April 20, 1899.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors are prepared to receive TENDERS for the supply of fresh wrought unscreened GAS COAL, to be delivered into the Gas-Works at Elswick, Newcastle-upon-Tyne, and/or Redheugh, Gateshead, in quantities as required during a period of Twelve Months commencing on the 1st of July next.

Tenders, endorsed "Tender for Gas Coal," enclosing a copy of the latest Analysis of the Coal offered, to be addressed to the Directors, and delivered at this Office not later than Ten a.m. on Monday, the 1st of May next.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
THOS. WADDOM,
Secretary.

35, Grainger Street West,
Newcastle-upon-Tyne, April 19, 1899.

HINCKLEY URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council are prepared to re-ceive TENDERS for the supply and erection of FOUL MAIN and FOUR ANNULAR CONDENSERS.

Full Particulars may be obtained from Mr. Lee, Gas-Works, Hinckley.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in to the undersigned not later than Monday, May 1, 1899.

By order,
J. W. PRESTON,
Clerk.

TO COAL MERCHANTS, SHIPOWNERS, AND OTHERS.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of about 14,000 Tons per annum (or such other quantity as may be agreed on) of best approved GAS COALS.

Tenders to state the price of the Coals, and the freight to Dartmouth or Torquay, separately and together, and also for delivery into the Company's Works, adjoining the Great Western Railway, free of all charges.

Further Particulars and Forms of Tender to be obtained from Mr. Beynon, the Manager of the Company, Hollacombe, Paignton; and Tenders to be sent to the undersigned before the 11th of May next.

JOHN KITSON,
Secretary.

Torquay, April 12, 1899.

EASTBOURNE GAS COMPANY.

TENDERS FOR COALS.

THE Directors of the Eastbourne Gas Company invite TENDERS for the supply of 30,000 Tons of best unscreened GAS COALS for One, Two, or Three Years respectively from the 1st day of September next at the option of the Company, to be declared when the Tender is accepted.

The Coals to be delivered at the Eastbourne Railway Station in equal monthly quantities.

Further Particulars may be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Coals," must be sent in not later than the 1st day of May, 1899.

The Directors do not bind themselves to accept the lowest or any Tender; and they reserve to themselves the right to divide the quantity above named into two or more contracts.

By order,
J. H. CAMPION COLES,
Secretary.

TENDERS FOR GAS COAL.

THE Directors of the Bath Gaslight and Coke Company invite TENDERS for the supply of about 36,000 Tons of GAS COAL, screened or unscreened, upon Contracts of 3000 Tons, or multiples of that quantity, during the Year commencing the 1st of July next.

The Directors undertake to Purchase from each party whose Tender is accepted a total quantity of at least 3000 Tons; but do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender may be obtained on application to Mr. C. S. Ellery, the Company's Engineer.

Tenders, endorsed "Tender for Gas Coal," to be sent in, addressed to the undersigned, not later than Twelve o'clock (noon) on Friday, the 5th day of May next.

GEORGE HELPS,
Secretary.

Gas Company's Offices, Bath,
April 18, 1899.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply during the Twelve Months from the 1st day of July, 1899, to the 30th day of June, 1900, of 11,000 Tons (more or less) of GAS COAL (screened or unscreened), to be delivered at the Bushey Station of the London and North-Western Railway.

Forms of Tender and Information may be obtained on application (in writing only) of me the undersigned.

Tenders to be delivered on or before the 5th day of May, 1899, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tenders for Gas Coal."

Tenders must be on the form supplied, any alteration of which will invalidate the Tender.

The Directors do not bind themselves to accept any Tender.

WILLIAM ROWELL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, April 14, 1899.

BOROUGH OF BRIGHOUSE.

TENDERS FOR GAS COAL, CANNEL, AND LIME

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of GAS COAL and CANNEL and BUXTON LIME required at the Mill Lane and Birds Royd Gas-Works during the Year ending the 30th of June, 1900.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane, Brighouse.

Sealed Tenders, stating price per ton delivered at the Gas-Works, or alongside Gas-Works by the Calder and Hebble Canal, or at Brighouse Railway Station, must be sent in on or before Friday, May 5, 1899, addressed to the Town Clerk, Public Offices, Brighouse, endorsed on the outside "Tender for Coal" or "Lime," as the case may be.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Town Clerk's Office, Brighouse,
April 19, 1899.

PETERBOROUGH GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of screened GAS COAL, COBBLES, or NUTS for One Year, commencing the 1st of June, 1899.

Forms of Tender and Conditions may be obtained on application to the undersigned.

Tenders to be sent in by the 8th of May next, endorsed "Coal," and addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any Tender.

JOHN BARTON,
Secretary and Manager.

Gas-Works, Peterborough,
April 11, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

ALDERSHOT GAS AND WATER COMPANY.

300 £10 "E" FIVE PER CENT. PREFERENCE SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, April 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

CRAYS GAS COMPANY.

£2000 OF FIVE PER CENT. STOCK.

Ranking for a Standard Dividend of 5 per cent., subject to the Sliding-Scale; the last Dividend on similar Stock having been at this rate.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, April 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

WORTHING GASLIGHT AND COKE COMPANY.

300 £10 SHARES.

Ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale, the last Dividend on similar Shares having been at this rate.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, April 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of the late Robert Higdon, Esq., the Administratrix of the late Mrs. S. A. Higdon, and other Owners.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

£2000 ORIGINAL ORDINARY CONSOLIDATED STOCK & £500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

WEST HAM GAS COMPANY.

£900 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK, & 400 ORIGINAL SHARES, and

ILFORD GASLIGHT AND COKE COMPANY LIMITED.

20 £5 FULLY-PAID "B" SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, April 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the Lowestoft Water and Gas Company, the Directors of the Southend Water-Works Company, the Directors of the Enfield Gas Company, and other Owners.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Monday, May 8, at Two o'clock, in Lots:—

LOWESTOFT WATER AND GAS COMPANY—£6250 FOUR PER CENT. PERPETUAL DEBENTURE STOCK, and 132 £10 SHARES.

SOUTHEND WATER-WORKS COMPANY—500 £10 SHARES.

ENFIELD GAS COMPANY—£3500 STOCK; and

EASTBOURNE GAS COMPANY—51 £10 "B" SHARES.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TUBES AND FITTINGS
ALL KINDS
WRITE FOR PRICES
STAFFORDSHIRE TUBE Co., BIRMINGHAM.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 9th day of May next, at Three o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st day of December last, to elect Directors and an Auditor in place of those retiring by rotation, to declare a Dividend on the Preference Share Capital, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 26th inst. to the 9th prox., both inclusive.

By order of the Board,
SAMUEL WOOD,
Secretary.

Offices: 30, Gracechurch Street,
London, April 20, 1899.

THE Acetylene Illuminating Company, Limited, 63, Queen Victoria Street, London, E.C., GIVE NOTICE that they hold the BRITISH PATENT RIGHTS for the MANUFACTURE OF CALCIUM CARBIDE by means of the electric furnace, that they are bringing an action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from so manufacturing that product, and that they intend in the future to bring actions against all infringers of these Patents and all purchasers or users of Carbide of Calcium made in infringement of the same.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

THE READ-HOLLIDAY ACETYLENE COMPANY, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

Foolscap 4to, pp. 535, with 239 Illustrations and Steel Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

THE SIXTH (AND CENTENARY) EDITION
OF THE
HANDBOOK
FOR
GAS ENGINEERS AND MANAGERS.
BY
THOMAS NEWBIGGING,
M.Inst.C.E.

LONDON:
WALTER KING, 11, BOLT COURT,
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ENRICH YOUR GAS
WITH
CHEAP BENZOL.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
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HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

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W. RICHARDSON, Fitter.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16$\frac{1}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) 13$\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

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Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

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TELEGRAMS: "EVESON, BIRMINGHAM."

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Incandescent Burners from **5/6 per doz.**

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All other Incandescent Fittings at greatly reduced Prices.

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THORNLEY GAS COALS
WORKED BY THE
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OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
Ash . . . . . 2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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UNEQUALLED.

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MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

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LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
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Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
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FOR PRICES AND PARTICULARS, APPLY TO
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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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Important Improvements in Spent Lime Recovery

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By Recent Improvements, based upon long experience in all possible methods of Recovering Spent Lime, the Patentee begs to bring under the notice of Gas Engineers, Companies, and Corporations, the **Great Economy** and **Permanent Advantages** which the adoption of the System would secure. The Cost of Recovery is **guaranteed** to be largely under that of New Lime, and also that it will do as much work in the Purifiers, and with a considerably Diminished Working Pressure. Spent Lime, chiefly or wholly in the condition of Carbonate, such as resulting from the Purification of Water Gas, or by Passing Foul Gas through Oxide of Iron before the Lime, is **recovered** for **many years continuously** with absolutely unimpaired efficiency as a Purifying Agent.

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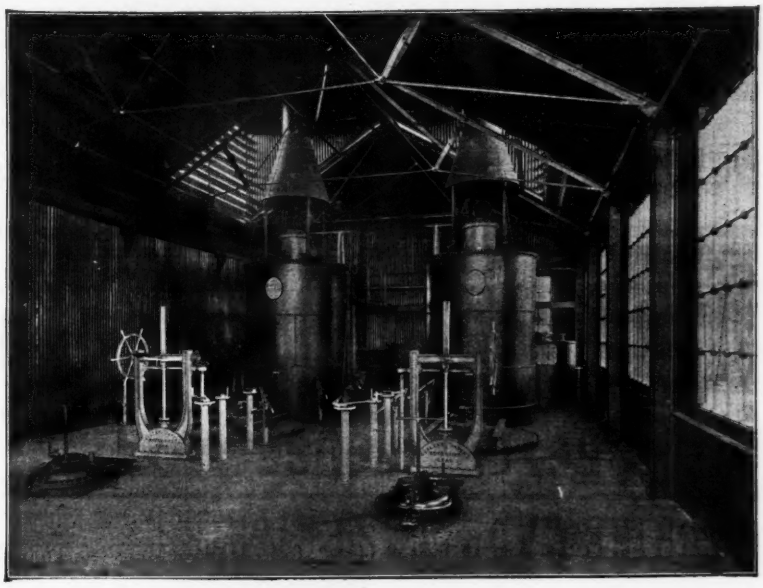
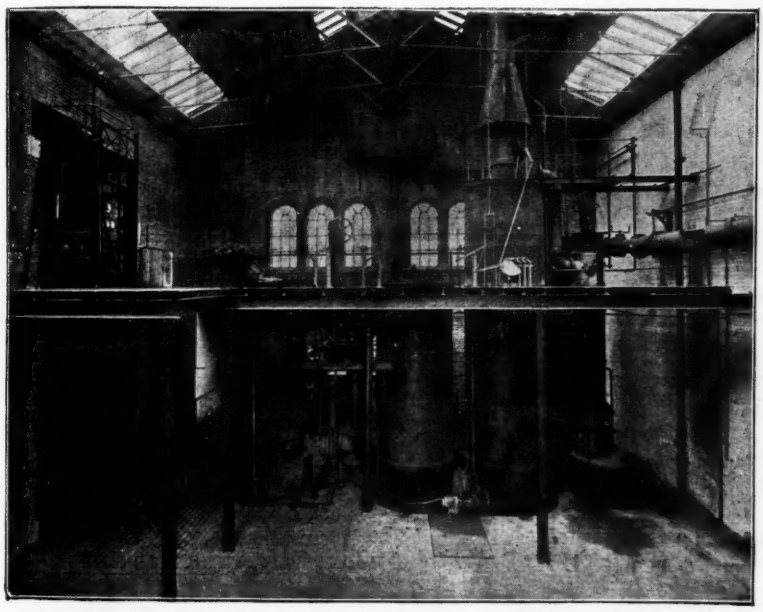


Water-Gas Plant at Southall.



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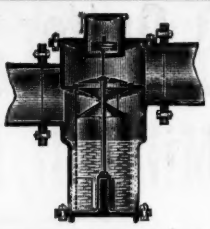

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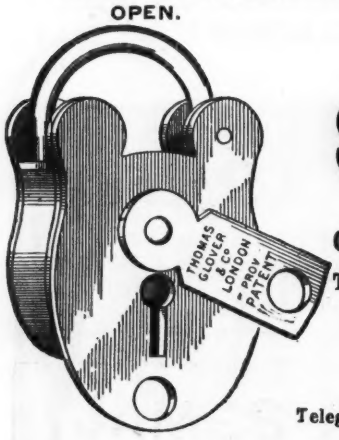

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The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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Provided with a most **SIMPLE** and **CONVENIENT METHOD** of **WATER LOADING** and **WITHDRAWAL** without syphons or other complications, or with weights to adjust pressure as desired.

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Incorporated with the Leeds Fire-Clay Company, Ltd.,

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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Patent Automatic Machinery
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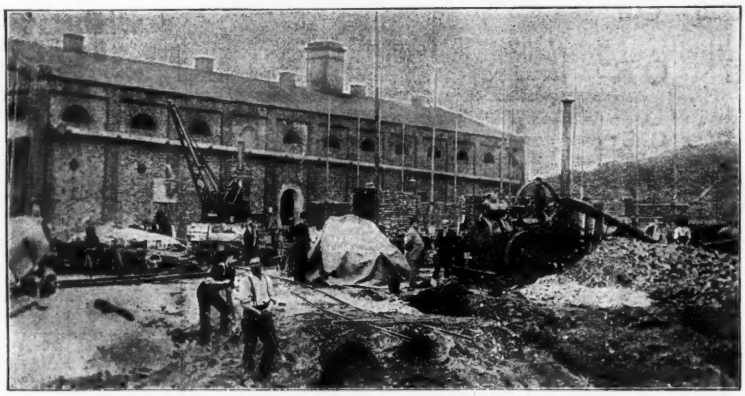

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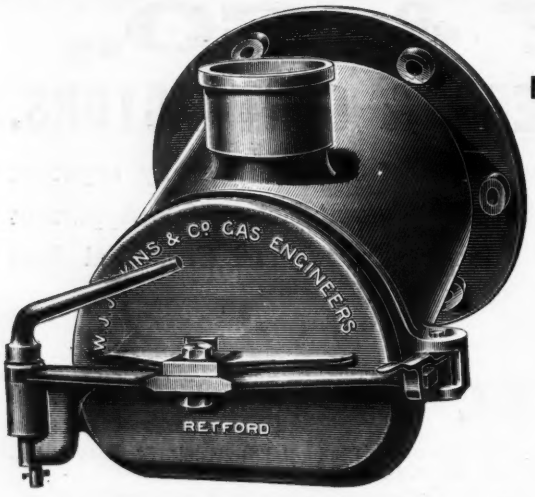
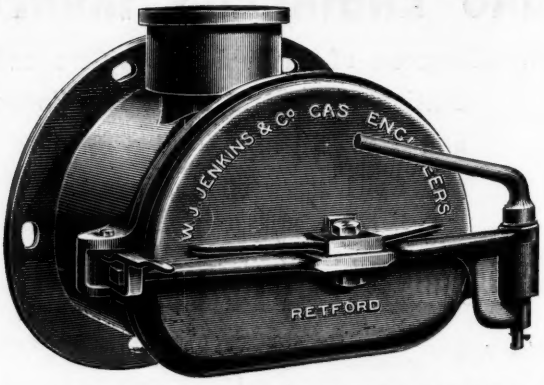
WITH SELF-SEALING LIDS FOR HORIZONTAL AND INCLINED RETORTS.





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Established 1836.

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RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

MACKRELL BROS.,
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Manufacturers of
IMPROVED GAS-METER PERSIANS.

UNSURPASSED FOR QUALITY AND VALUE.

MAKERS OF
CLAYTON, SON & Co LTD LEEDS
ALL KINDS GAS PLANT
COMPLETED IN 12 MONTHS
12,100,000 CUB FT CAPACITY.
GASHOLDERS
SPECIALITY
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
HIGH CLASS BOILERS &c
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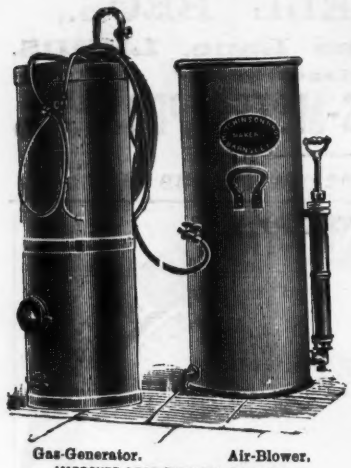

Gas-Generator. Air-Blower.
IMPROVED LEAD-BURNING APPARATUS.

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GAS ENGINEERS, &c.

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LEAD WORK FOR SULPHATE OF AMMONIA PLANTS.

BEST QUALITY OF MATERIAL AND WORKMANSHIP.

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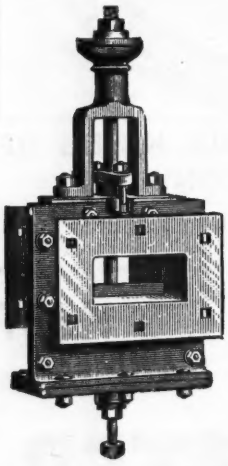

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